Fire & Rescue NSW

Alexandria Training Facility

Environmental Site Assessment - PFAS

April 2019

Executive summary

GHD Pty Ltd (GHD) was commissioned by Fire and Rescue NSW (FRNSW) to undertake a combined preliminary and detailed site investigation at a land parcel identified within Lot 11 DP 135903, located at 189 Wyndham Street, Alexandria, NSW 2015 (the site). Works were completed between March and April 2017.

At the time of the investigation, the site was used as the State training college for firefighting training. The historical training of firefighters has potentially included the use of aqueous film forming foams (AFFF). The foams used may have contained perfluoro alkyl substances (PFAS) including perfluorooctane sulfonate (PFOS) and perfluorooctanoic acid (PFOA), which are potentially harmful to human health and the environment.

The NSW Environmental Protection Authority (NSW EPA) is currently undertaking an investigation program to assess the historical legacy of PFAS use across NSW. As part of this program, EPA identified impact in surface water down gradient of the wider training facility and requested further investigation to understand potential contamination issues be undertaken by FRNSW.

The overall objective of the investigation was to assess the potential for off-site migration of PFAS originating from the site via surface water flows.

The scope of work comprised:

- Collection of three sediment samples (SS01 to SS03) and five surface water samples (SW01 to SW04 and SP_450_01).
- Laboratory analysis of selected sediment and surface water samples for chemicals of potential concern (COPC)

The following conclusions were made:

- The concentration of PFAS in sediments were low, however PFAS was detected at all monitoring locations. The results of the sediment sampling confirm that the sediments within the stormwater channel are impacted by PFAS, and that impacted sediments from the site have the potential to migrate off-site. The presence of PFAS in sediments represents a potential on-going source for surface water receptors.
- Leachability testing confirmed that sediments have the potential to release PFAS to the environment.
- All surface water samples collected in the stormwater channel exceeded the ecological guidelines for PFAS.
- The stormwater outlet pipe from the FRNSW site discharging into the stormwater channel reported the highest concentrations of PFAS (SP_450_01), which exceeded the ecological and recreational water guidelines. The low concentrations of PFAS in the stormwater channel indicates that there is little retention of PFAS impacted water from the site along the channel. This body of water sampled as SP_450_01 is therefore expected to move rapidly to down-gradient water bodies such as Alexandria Canal and possibly the Cooks River and/or Botany Bay.

Based on the outcomes of the targeted sampling undertaken in March 2017, GHD recommended consideration of management actions which can be implemented to address the mass of PFAS present on site and minimise further migration. These management actions may include, but not be limited to:

- Assess and implement measures to stop (or minimise) the off-site discharge of surface waters from the site.
- Where off-site discharge is permitted it should be managed, where applicable, in accordance with the relevant operational approval, licence or permit.
- Additional groundwater and surface water sampling should be undertaken following the implementation of any management actions. Sampling should be undertaken to accommodate seasonal fluctuation, for example, following rainfall events.
- Additional soil sampling at areas not previously assessed (e.g. Douglas Partners 2015) be undertaken to identify PFAS impacted locations and inform migration pathways.

Glossary

Abbreviation	Description
AHD	Australian Height Datum
ALS	Australian Laboratory Services
ANZECC	Australian and New Zealand Environment and Conservation Council
BTEXN	Benzene, toluene, ethylbenzene, xylenes and naphthalene
COC	Chain of custody
COPC	Contaminants of potential concern
CSM	Conceptual site model
DBYD	Dial Before You Dig
DO	Dissolved oxygen
DQI	Data quality indicator
DQO	Data quality objective
EC	Electrical conductivity
EIL	Ecological Investigation Level
EPA	NSW Environment Protection Authority
ESA	Environmental Site Assessment
ESL	Ecological Screening Level
GIL	Groundwater Investigation Level
GME	Groundwater monitoring event
HIL	Health Investigation Level
HSL	Health Screening Level
JSEA	Job Safety Environmental Analysis
LOR	Limit of reporting
mAHD	metres Australian Height Datum
m bgl	Metres below ground level
mbTOC	Metres below top of casing
mg/L	Milligrams per litre
NATA	National Association of Testing Authorities
NEPC	National Environment Protection Council
NEPM	National Environment Protection Measure
NHMRC	National Health and Medical Research Council
PID	Photo-ionisation detector
QA/ QC	Quality assurance/ quality control
REDOX	Oxidation-reduction potential
RPD	Relative Percent Difference
SFOP	Standard field operating procedures
SWL	Standing water level
TOC	Top of casing
µg/L	Micrograms per litre

Table of contents

Table index

Appendices

1. Introduction

GHD Pty Ltd (GHD) was commissioned by Fire and Rescue NSW (FRNSW) to undertake a combined preliminary and detailed site investigation at a land parcel identified within Lot 11 DP 135903, located at 189 Wyndham Street, Alexandria, NSW 2015 (the site).

The area has previously been used for the training of firefighters, which has potentially included the use of aqueous film forming foams (AFFF). The foams used may have contained perfluoro alkyl substances (PFAS) including perfluorooctane sulfonate (PFOS) and perfluorooctanoic acid (PFOA), which are potentially harmful to human health and the environment.

A preliminary site investigation (PSI) was undertaken by GHD in 2016 to identify potential sources of contamination and areas of potential concern and develop a sampling and analytical plan for further intrusive investigations. The findings of the PSI are reported in:

- GHD (2016) *Alexandria PFAS Investigation, Preliminary Site Investigation and Sampling and Analysis Quality Plan*. August 2016.

This report documents the outcomes of site investigations undertaken as part of the second stage of works between march and April 2017. For full details on the site history, reference is made to GHD 2016.

1.1 Background

The site is approximately 10,500 m^2 within Lot 11 DP 135903. The approximate site boundaries are presented in Figure 1, Appendix A. The site boundary previously included Lot 2 DP 552864 and Lot 701 DP 713555 located on the northern site boundary but these sections have recently been sold to Sydney Trains.

The site is currently used as the state training college for firefighting training and is one of the main training sites of FRNSW. The site also consists of the Alexandria Fire Station and offices (Figure 1, Appendix A). The site is bound by, Sydney Trains (formerly FRNSW), Mandible Street and commercial developments to the north, commercial developments to the east, Bourke Street then commercial and industrial developments to the south, and Wyndham street then commercial and industrial developments to the west.

GHD understands AFFF and other firefighting foams potentially containing PFAS have historically been used at a number FRNSW locations in NSW for firefighting training purposes. For this reason, PFAS may have been released to the environment, which may have resulted in contamination.

The NSW Environmental Protection Authority (NSW EPA) is currently undertaking an investigation program to assess the historical legacy of PFAS use across NSW. As part of this program they have identified impact in surface water down gradient of the wider training facility and have requested further investigation to understand potential contamination issues be undertaken by FRNSW.

1.2 Objective

The overall objective of the investigation is to assess the potential for off-site migration of PFAS impact originating from the site via surface water flows.

1.3 Scope

The scope of work comprised:

- Preparation of a Health, Safety and Environment Plan (HSEP) and site specific Job Safety and Environmental Analysis (JSEA)
- Preparation and organising for confined space entry including a confined space management and emergency response plans and approvals from Sydney Water.
- Collection of three sediment samples (SS01 to SS03) and five surface water samples (SW01 to SW04 and SP_450_01).
- Laboratory analysis of selected sediment and surface water samples for chemicals of potential concern (COPC) including:
  - PFAS, total recoverable hydrocarbons (TRH), benzene, toluene, ethylbenzene, and xylene (collectively referred to as BTEX), polycyclic aromatic hydrocarbons (PAH), heavy metals, total organic carbon (TOC), cation exchange capacity (CEC), major ions, in soil and sediments.
  - PFAS, TRH, BTEXN, PAH and heavy metals (standard laboratory limit of reporting), major ions and total dissolved solids (TDS) in surface water.
- Laboratory analysis of a selection of sediment samples for Australian standard leaching procedure (ASLP).
- A quality control and quality assurance (QA/QC) program.
- Preparation of this site investigation report.

GHD notes that the scope of works delivered differs from that listed in the PSI (GHD, 2016) and the sample analysis and quality plan (SAQP). The initial objective of the works was revised at the request of FRNSW in order to reflect the change in ownership of the site.

1.4 Limitations

This report is subject to the limitations provided in Section 11.

2. Site description

2.1 Site identification

A summary of the FRNSW site identification details is provided in Table 2-1, and location is presented in Figure 1 in Appendix A.

Table 2-1 FRNSW site identification summary

Information	Details
Street Address	189 Wyndham St, Alexandria, NSW 2015
Lot and DP number	Lot 11 Deposited Plan 135903
Site Area	Approximately 10,500 m^2, with a perimeter of approximately 513 m
Local Government Area	City of Sydney
Local Land Use Zoning	B7 - Business Park
Current Land Use	Training site

2.2 Surrounding land use and zoning

The land uses surrounding the FRNSW site are summarised below in Table 2-2.

Table 2-2 Description of land use surrounding FRNSW site and respective zonings

Orientation	Description of Surrounding Land Use	Zoning (City of Sydney LEP 2012)
North	Mandible Street and commercial developments	B7 – Business Park B4 – Mixed Use
East	Commercial developments	B7 – Business Park B6 – Enterprise Corridor
South	Bourke Street then commercial and industrial developments	B7 – Business Park
West	Wyndham Street then high density residential and commercial and industrial developments	B4 – Mixed Use R1 – General Residential

2.3 Site environmental setting

2.3.1 Topography

The site lies approximately at 10 m Australian Height Datum (AHD), according to the *NSW Globe* from Land and Property Information. The natural ground level across the site is relatively flat, with a slight downward slope to the west. The regional topography appears to rise to the north and east from the site.

2.3.2 Soils

General

According to eSPADE from Office of Environment & Heritage, the site is within the Aeolian 'tg' Tuggerah soil landscape. The Tuggerah soil landscape has the following characteristics:

- **Landscape:** gently undulating to rolling coastal dunefields. Local relief to 20 m, slope gradients generally 1-10%, but occasionally up to 35%. North— south oriented dunes with convex narrow crests, moderately inclined slopes and broad gently inclined concave swales. Extensively cleared open-forest and eucalypt/apple woodland
- **Soils:** deep (>200 cm) Podzols on dunes and Podzols/Humus Podzol intergrades on swales.
- **Limitations:** extreme wind erosion hazard, non-cohesive, highly permeable soil, very low soil fertility, localised flooding and permanently high water tables.

Acid Sulphate Soils

Disturbed terrain (greater than four metres elevation) underlies the whole site (Land and Water Conservation 1997a). Disturbed terrain may include filled areas, which often occur during reclamation of low lying swamps for urban development. Other disturbed terrain includes areas which have been mined or dredged, or have undergone heavy ground disturbance through general urban development or construction of dams or levees.

Intrusive site investigations undertaken by Douglas Partners (2015) identified the presence of acid sulphate soils beneath the site.

2.3.3 Hydrology

Sheas Creek is located in the southern area of site. Sheas Creek discharges into Alexandra Canal, located approximately 1 km south-west of the site which is hydraulically connected to Botany Bay. Dial before you dig (DBYD) information shows Sheas Creek as being the stormwater infrastructure through the site as well as receiving stormwater from areas up-gradient of the site.

Surface water flow is expected to follow the local topography on-site, flowing south and west over land into internal stormwater infrastructure. The stormwater infrastructure exits into Sheas Creek (refer to Section 2.3.6 for further discussion).

2.3.4 Geology

The site is located within the Botany Sands, which are expected to have a high overall hydraulic conductivity. However, the site is located in Zone 2 of the Botany Groundwater Management Zone, which bans the abstraction of groundwater for domestic use (NSW Department of Primary Industries website, 2015). This ban was caused by a range of industries that have operated in the Botany area over the last 100 years, which has resulted in solvents, petroleum hydrocarbons, and heavy metals that may have contaminated the aquifer.

2.3.5 Hydrogeology

Existing Groundwater Bores

GHD conducted a review of existing groundwater borehole records using the NSW Department of Primary industries, Office of Water, groundwater database. The search was conducted to identify registered groundwater boreholes in close proximity and to record information such as use and standing water level. Eighteen registered groundwater boreholes were identified within a 500 metre radius of the site, as summarised in Table 2-3.

None of these groundwater boreholes are within the site boundary, and one was identified as potentially used for 'domestic' purposes.

Additionally, Douglas Partners (2015) installed three groundwater wells on the site and neighbouring property as shown in Figure 2, Appendix A. These unregistered bores are not included in Table 2-3, however further discussion is provided in Section 2.4. Groundwater elevations from DP (2015) suggest that groundwater is likely to be flowing in a south to south-westerly direction, however this is based on a small number of measurements.

Table 2-3 Review of existing registered groundwater bores

Borehole ID	Purpose	Depth (m)	Standing Water Level (m)	Approx. Distance from Site	Drillers Log
GW017342	Industrial	No details	No details	80 m north	Fill (<0.3m) underlain by peaty sand and clay
GW017684	Industrial	14.9	No details	45 m south east	Peaty sand underlain by sand and clay
GW106046	Domestic		No details	265 m south	No details
GW109789	Monitoring Bore	5	No details	190 m south east	Concrete (<0.1m) underlain by fill (<3m) then clay and shale
GW109790	Monitoring Bore	4	No details	200 m south east	Concrete (<0.1m) underlain by fill (<3m) then clay and shale
GW109791	Monitoring Bores	4.1	No details	210 m south east	Concrete (<0.2m) underlain by fill (<3m) then clay
GW109792	Monitoring Bore	4.2	No details	190 m south east	Concrete (<0.2m) underlain by fill (<3.5m) then silt and clay
GW112478	Monitoring Bore	4.5	3.7	310 south east	Fill (<1.8m) underlain by clay
GW112479	Monitoring Bore	7	5.1	310 m south east	Fill (<5.5m) underlain by clay
GW112480	Monitoring Bore	7	5.5	305 m south east	Fill (<4.6m) underlain by clay
GW113035	Monitoring Bore	No details	No details	260 m north west	No details
GW113036	Monitoring Bore	No details	No details	270 m north west	No details
GW113037	Monitoring Bore	No details	No details	295 m north	No details
GW113038	Monitoring Bore	No details	No details	290 m north	No details
GW113039	Monitoring Bore	No details	No details	320 m north	No details
GW114167	Monitoring Bore	No details	No details	420 m east	No details
GW114168	Monitoring Bore	No details	No details	400 m east	No details
GW114169	Monitoring Bore	No details	No details	390 m east	No details

Groundwater risk map

The *1:2,000,000 Groundwater in New South Wales, Assessment of Pollution Risk Map (*Department of water resources 1987*)* indicates that the site is likely to be underlain coastal dune sands, with high potential for groundwater movement. The map also indicates that groundwater salinity is likely to be between 0-1,000 mg/L (in the deeper sandstone aquifer), which is suitable for stock, domestic and some irrigation purposes.

2.3.6 Surface water and drainage

A concrete stormwater channel, Sheas Creek, runs underneath the site, and flows to the west. The stormwater channel of Sheas Creek flows into the Alexandria Canal and eventually into the Cooks River and Botany Bay (Section 2.3.3). Surface water flow is expected to follow the local topography on-site, flowing south and west over land into internal stormwater infrastructure. This was confirmed by GHD during a site visit (15 March 2017) as summarised in Table 2-4.

Drainage features within training facility

The training facility is predominantly asphalt and concrete covered with minimal areas of exposed soils. Surrounding the main training facility yard there are a series of drains which both surround the perimeter, and flow through the centre of the site. It is understood that all these drains flow towards the southern portion of the site, potentially to an underground water collection tank. It was not observed where the water then was discharged from this tank.

During the surface water and sediment sampling (15 March 2017), fire training exercises using water were undertaken and subsequently filled the site drains. A large 450 mm stormwater pipe was observed underneath the site opening into Sheas Creek. Significant surface water discharge was observed occurring, which is assumed to be sourced from the FRNSW site (flow began during the fire training exercise and ceased when the exercise was completed).

The surface water flow across the hardstand of the site appeared to predominately flow to the south-west corner of the site; towards the perimeter drains surrounding the central training area. Further observations are summarised in Table 2-4.

Off-site drainage features

The stormwater drainage channel in the southern section of the site collects stormwater from the greater Alexandria area and flows to the south-west towards the Alexandria Canal.

It was observed during the sediment and surface water sampling (15 March 2017), that multiple drainage pipes enter the stormwater channel from the various commercial and industrial properties.

The Alexandria Canal is approximately 1 km to the south-west of the site. The canal eventually flows into the Cooks River and then into Botany Bay.

2.4 Summary of previous investigations

Douglas Partners conducted a detailed site investigation (DP, 2015) at the site on behalf of Sydney Trains. The investigation was undertaken for the northern part of the site (Lot 2 DP 552864 and Lot 701 DP 713555) however, it included results for the whole site. The report summarised a previous preliminary site investigation undertaken by Douglas Partners in 2014 which documented that underground fuel storage tanks, an underground water tank and previous commercial and industrial land uses were the main sources of contamination for the site.

Douglas Partners (2015) reported that six underground fuel storage tanks were previously located on the site. Four out of the six tanks were reportedly decommissioned in situ in 1998

and one was removed. No details were provided for the final tank, however, the status of this tank is unclear. The locations of these former fuel storage tanks are shown on Figure 2, Appendix A.

The Douglas Partners (2015) investigation included the drilling of nine boreholes of which three were converted into groundwater wells. Soil samples were analysed for total recoverable hydrocarbons (TRH), heavy metals, benzene, toluene, ethylbenzene and xylene (BTEX), polycyclic aromatic hydrocarbons (PAHs), phenols, organochlorine pesticides (OCPs), polychlorinated biphenyls (PCBs), volatile organic compounds (VOCs) and asbestos.

Groundwater samples were analysed for PFAS during the second sampling event and the following results were noted:

- PFOS was recorded in all wells with the highest concentration of 3.98 µg/L reported groundwater sample MW9A.
- PFOA was recorded at a concentration of 0.52 µg/L in groundwater sample MW9A;

It is noted that the highest PFOS and PFOA concentrations were recorded at a well located closest to the fire training ground.

2.5 Site layout and key site features

A site inspection was undertaken initially by GHD in June 2016, a secondary inspection was undertaken as part of the sampling works in March 2017. Observations including site layout and key features made during the site inspections are summarised in Table 2-4.

Table 2-4 Key features

Items		Comments
General	Site use	The site is used for fire training exercises for new recruits. There are fire training gas props and the training tower that are located in the south-western corner of the site. There are training rooms located around the site, a fire station off Wyndham Street and the communication centre.
	Fencing	The perimeter of the site is either fences or buildings securing the site. There are three entries/exits from the site with a boom gates off Bourke Road and Wyndham Street and a gated fence off Mandible Street. Pedestrian access is possible into the site though the boom gates.
Ground surface	Ground cover:	The site is mostly sealed with asphalt with the exception near the entry point off Bourke Road where there is grassed landscaped area near the communication centre. The general ground cover relative to site areas is presented in Figure 2, Appendix A.
	Topography	The site is relatively flat with a slight downward slope to the west following the local topography of the area.
	Vegetation	There is little vegetation on the site. There are several mature trees located along the perimeter of the site. All vegetation appeared healthy at the time of the site inspection.
	Surface water / Drainage	There is a culvert of Sheas Creek located on-site with water flowing to the west (approximately at 3 m below ground level). This culvert runs underneath the site. There are drains running along the southern part of the site that collect surface water, which collects in a pit/tank underground. Historically the water was recycled through a pump house located near the communication centre. However, anecdotal evidence indicated the pumps kept getting blocked and therefore were removed. This water still collects in the underground pit and overflows into the stormwater system. An interceptor is located near the former truck wash area. Further inspection from within the stormwater culvert shows there are many drainage pipes leading into the channel. The inspection was undertaken during fire training activities and a single large pipe was noted to be flowing from the site.
Evidence of contamination	Litter	The site was generally clean and free of litter. There are skip bins for waste located on site.
	Waste drums or bulk storage facilities	There were three storage places where AFFF has been stored in the past. One is located within the training tower, one near the communication centre and one on the southern side of the fire training ground. All areas are able to be secured and on hard stand. The two storage areas that were accessible were clean with no evidence of any spills. Underground storage tanks (USTs) were previously noted on the site and areas containing former USTs is presented in Figure 2, Appendix A. Anecdotal evidence provided indicated that a storage / collection tank potentially exists under the training tower. No evidence of this tank was observed during the site inspection.
	Fill	No fill was observed during the site inspection, however, the site appeared to have been levelled at some stage.

3. Data Quality Objectives

The Data Quality Objectives (DQOs) for the investigation are based on guidance presented in:

- NEPC (2013) *National Environmental Protection (Assessment of Site Contamination) Amended Measure (NEPM) No. 1 – Schedule B1, Guideline on Investigation Levels for Soil and Groundwater.*

The DQOs establish a framework for contamination investigations which incorporates a seven stepped continuum that defines the problem at the site. A series of stages then optimises the design of the investigation. The seven steps are outlined below:

- Step 1: State the Problem
- Step 2: Identify the Principal Study Question
- Step 3: Inputs to the Decision
- Step 4: Boundaries of the Study
- Step 5: Decision Rules
- Step 6: Tolerable Limits on Decision Errors
- Step 7: Optimisation of the Data Collection Process

An overview of the DQOs for the investigation are presented in the following steps.

Step 1: State the problem

The area has previously been used for the training of firefighters, which has potentially included the use of aqueous film forming foams (AFFF). The AFFF used may have contained PFAS including perfluorooctane sulfanoate (PFOS) and perfluorooctanoic acid (PFOA), which are potentially harmful to human health and the environment.

The problem as it stands is the use of AFFF containing PFAS may have resulted in contamination of soil, surface water, groundwater and sediments on the FRNSW site, which may be migrating to receptors off-site via surface water flows. This potential migration path requires further investigation.

Step 2: Identify the decision/goal of the study

The key study questions to be answered as part of the works is:

- Are contaminants migrating from the site via surface water flows at concentrations which pose a potentially unacceptable risk to human health or the environment under the adjacent land-uses?
- Is the data obtained of an acceptable quality to enable appropriate conclusions to be made in relation to the overall risks to human health and/ or the environment?

Should contamination present at the site pose a potentially unacceptable risk to off-site receptors based on concentrations of PFAS in surface waters, the other decisions to be made are:

- Is the extent of the impact adequately delineated?
- Is further assessment or remediation/management required?

Step 3: Identify the information inputs

The following inputs are required for the decision:

- The location of potential PFAS contamination sources
- The concentrations of PFAS in surface water from laboratory analysis.
- Identify potential exposure routes and contamination migration pathways.
- The likelihood of potential PFAS migrating off-site.

Step 4: Define the boundaries of the study

Boundaries of the investigation are summarised in Table 3-1.

Table 3-1 Investigation boundaries

Boundary	Definition
Spatial boundaries	The spatial boundaries for the site are identified as the lateral extent of the investigation locations as shown in Figure 2, Appendix A.
Temporal boundaries	The timeframe for this investigation's scope of work primarily defined to the period of works undertaken in the investigation area as part of this assessment; namely June (preliminary site investigation) to March 2017.
Scale of decision making	The scale of the decision making is limited to the surface water migration pathways on and off-site.
Potential constraints on data collection	Access to the proposed sampling locations may be restricted by confined space entry into the stormwater channels.

Step 5: Decision rules

The degree of impact by contaminants and the decisions associated with accepting data will be assessed with reference to the chosen site investigation levels, which were established within the framework of guidelines made or approved by the NSW EPA.

The criteria used for screening analytical results are discussed in Section 5.

The decision rule was considered to be:

- If concentrations of the COPC in surface water on or off-site exceed the adopted criteria for permissible land use(s) (as per current zoning), then further assessment, remediation and/or management may be required.
- Conversely, no further action may be required in the event that concentrations are below adopted site criteria.

Step 6: Tolerable limits on decision errors

Data generated during this investigation must be appropriate to allow decisions to be made with confidence.

Specific limits for this investigation have been adopted in accordance with the appropriate guidance from the AS4482.1, which includes appropriate indicators of data quality (data quality indicators [DQIs] used to assess QA/QC, and GHD's Standard Field Operating Procedures). The pre-determined DQIs established for the investigation are discussed in Appendix E.

If any of the DQIs are not met, further investigation will be necessary to determine whether the non-conformance will significantly affect the usefulness of the data.

Step 7: Optimisation of the data collection process

This step involves identifying the most resource effective sampling and analysis design which is required to satisfy the DQOs. The sampling and analysis plan which was developed to meet this objective is summarised in Section 4.

GHD notes that the scope of works delivered differs from that listed in the PSI and the initial sample analysis and quality plan (SAQP) (GHD, 2016). The initial objective of the works was revised at the request of FRNSW in order to reflect the change in ownership of the site.

4. Methodology

4.1 General

The scope of work is summarised in Section 1.3. The tables in Section 4.2 and 4.3, summarise the sediment and surface water sampling methods from the surface water flow pathways.

4.2 Sediment sampling

Table 4-1 Sediment sampling methodology

Item	Description
Date of fieldwork	15 March 2017
Work clearance	JSEA including daily pre-work assessment and hazard identification, confined space management and emergency response plan. Approvals from Sydney Water to access the stormwater channel.
Technical guideline	GHD's Standard Field Operating Procedures
Sampling	Samples were collected by hand using disposal nitrile gloves and were placed directly into laboratory supplied sample jars.
Sample handling and transport	Following collection, sediment samples were immediately placed on ice and stored in a cool, dark environment (esky) prior to being forwarded to the analytical laboratory within the specified holding times along with a COC form (Appendix D).
Decontamination	The collection of sediment samples was undertaken by hand, using disposal nitrile gloves. The gloves are disposed of after single use and new gloves used for each new sample.
Sample analysis	All sediment samples were submitted for laboratory analysis of COPC including PFAS, TRH, BTEXN, PAH, eight heavy metals, total organic carbon (TOC), CEC and major ions.
Quality assurance and quality control (QA/QC)	QA/QC sampling included one intra-laboratory and one inter-laboratory duplicate sample.

4.3 Surface water sampling

Table 4-2 Surface water sampling methodology

Item	Description
Date of fieldwork	15 March 2017
Work clearance	JSEA including daily pre-work assessment and hazard identification
Technical guideline	GHD's Standard Field Operating Procedures
Field chemistry	Field parameters temperature, pH, electrical conductivity (EC), dissolved oxygen (DO), reduction-oxidation potential (redox) and temperature of the surface water were also recorded at each sample point using a water quality meter placed directly into the water body. Field sampling sheets are presented in Appendix C.
Sampling	Surface water samples were collected from locations directly from the water body into laboratory provided sample containers. Samples for heavy metal analysis were filtered through a 0.45 µm filter before being placed in the sample bottles.

Item	Description
Sample handling and transport	The sample bottles were transferred to an ice filled cool box for sample preservation prior to and during shipment to the sampling laboratory. A chain of custody form was completed, and forwarded with the samples to the testing laboratory.
Decontamination	Dedicated sample bottles were used to collect surface water samples, eliminating the need for decontamination of equipment and rinsate samples. Disposal nitrile gloves will be used when sampling and new gloves used for each new sample.
Sample analysis	All surface water samples were submitted for laboratory analysis of COPC including PFAS, TRH, BTEXN, PAHs, metals, TDS, TOC and major ions.
Quality assurance and quality control (QA/QC)	QA/QC sampling included one intra-laboratory and one inter-laboratory duplicate sample.

5. Assessment criteria

5.1 Basis for assessment

Screening criteria for the assessment of PFAS is an evolving field. Investigation levels adopted for the purpose of this investigation are current at the time of works (March 2017). GHD notes these criteria differ to those initially outlined in the SAQP presented in GHD (2016) as new guidelines have been developed since the preparation of the PSI (GHD, 2016). The screening criteria documented herein supersede any criteria previously specified in the PSI.

It is noted that the assessment of PFAS impacted sites is a rapidly developing field and consequently site assessment criteria are continually under review and may be revised as new scientific information comes to light.

This investigation was completed with reference to the following guidelines and documentation:

- NSW DEC (2006) *Contaminated Sites: Guidelines for NSW Site Auditor Scheme*
- NSW DECC (2015) *Guidelines on the Duty to Report Contamination under the Contaminated Land Management Act 1997*
- NSW EPA (2011) *Contaminated Sites: Guidelines for Consultants Reporting on Contaminated Sites*
- NEPM (2013) *National Environment Protection (Assessment of Site Contamination) Amendment Measure (No.1),* National Environment Protection Council (NEPC)
- Department of Environment Regulation (DER), January 2017. *Interim Guideline on the Assessment and Management of Perfluoroalkyl and Polyfluoroalkyl Substances (PFAS),* Contaminated Sites Guidelines, Government of Western Australia (WA).
- Department of Environment and Energy (DEE), October 2016. DRAFT *Commonwealth Environmental Management Guidance on Perfluorooctane Sulfonic Acid (PFOS) and Perfluorooctanoic Acid (PFAS).*
- EnHealth, June 2016. *Interim national guidance on human health reference values for per- and poly-fluoroalkyl substances for use in site investigations in Australia*.
- Environmental Risk Sciences Pty Ltd, February 2016. *Proposed Decision Tree for Prioritising Sites Potentially Contaminated with PFAS, New South Wales Environment Protection Authority* (NSW EPA).
- Food Standards Australia New Zealand (FSANZ), 2017. *Health Based Guidance Values for PFAS – for use in site investigations in Australia*. Department of Health, Australia.

5.2 Rationale for assessment criteria

The assessment criteria were selected to allow decisions to be made for the following identified receptors for surface water flows (from Section 2):

- FRNSW and on-site commercial workers associated with the training facility.
- Potential intrusive maintenance workers on and off-site
- Off-site hydraulically down-gradient commercial/industrial receptors.
- Potential recreational users of surface waters down hydraulic gradient from the site.
- Terrestrial and aquatic ecological receptors on and off-site in surface water bodies (including Alexandria Canal, Cooks River and Botany Bay).

This investigation focused primarily on surface waters and sediments. No soil or groundwater samples were collected during this stage of works, therefore only guidelines applicable to surface water and sediments were considered.

5.3 Leachability

Most of the currently available PFAS guidelines are based on direct contact with contaminated media. However, as PFAS is highly soluble in water, and can be washed through soil/sediments into underlying groundwater or discharged into river systems, the leaching potential of the PFAS in soil/sediments should be the focus on an initial assessment (NSW EPA, 2016). No investigation levels for the evaluation of leachate data are available at the time of issue of this report. As such, leachate data has been used for the purpose of assessing risks to potential receptors only.

5.4 Nominated PFAS assessment criteria

5.4.1 Sediment

Sediments are an important source of persistent chemicals to the water column and aquatic organisms (CRC CARE, 2017). At the time of issue of this report, only limited guidance is available for the purpose of screening PFAS concentrations in sediments. In the absence of well validated screening criteria, CRC CARE (2017) provide some guidance with respect to potential options for sediment investigations including the assessment of pore water or water column investigations. Given the preliminary nature of works undertaken as part of this investigation, and the environmental setting of the site comprising stormwater channels in an urbanised area, screening criteria were not considered appropriate at this state. Data reported from the collection of sediments in drainage channels has been reviewed in the context of the site setting and conceptual site model, taking into account potential exposure pathways to contaminated sediments, if any.

5.4.2 Surface water

The nominated screening levels are outlined in Table 5-1. Drinking water has not been included in this investigation as samples were only collected from the stormwater canal, which is unlikely to be used as a drinking water source considering its tidal nature and the general setting of the site in an urbanised commercial area with access to reticulated water supplies.

Table 5-1 Nominated screening criteria for surface water

Exposure Scenario	PFOS / PFHxS	PFOA	Basis for nomination of criteria
Ecological – freshwater and marine 99% protection level	0.00023 µg/L (PFOS only)	19 µg/L	Criteria adopted from the Draft ANZECC freshwater criteria for high conservation value systems (99% species protection). It is recommend that the 99% level of protection is used for slightly to moderately disturbed systems as PFAS and PFOA have been shown to bio accumulate in wildlife.
Recreational water	0.7 µg/L (sum of PFOS and PFHxS)	5.6 µg/L	Criteria adopted from FSANZ (2017) which is consistent with the approach used by enHealth (2016).

5.5 Assessment criteria –other COPCs

5.5.1 Sediment

The assessment of risk to human health, was undertaken in accordance with NEPC 2013. It was considered that due to the nature of the samples collected within the stormwater channel, and limited to access to those sediments, and the potential for direct contact or human health exposure was considered to be low. Therefore, NEPM 2013 HIL/HSL have been excluded from the assessment.

The adopted guidelines for the sediment investigation are the Interim Sediment Quality Guidelines (ISQG) presented in ANZECC/ARMCANZ Australian Water Quality Guidelines (ANZECC/ARMCANZ 2000). As outlined in ANZECC/ ARMCANZ (2000) the ISQGs enable:

- Identification of sediments where contaminant concentrations are likely to result in adverse effects on sediment ecological health;
- Decisions about the potential remobilisation of contaminants into the water column and/or into aquatic food chains; and
- Identification and protection of uncontaminated sediments. The guidelines are not intended for use as clean-up criteria, but rather investigation levels to trigger site-specific risk assessment and/ or management.

The adopted sediment criteria are presented in Table A in Appendix B. If the nominated assessment guidelines do not provide screening values for the analytes shown in the summary tables, the guideline was removed from the summary table.

Normalisation of sediment data

Most natural and anthropogenic substances, including metals and organic contaminants, show a higher affinity to fine grained particulate matter than coarse fraction sediments, with organic matter and clay minerals generally exhibiting the strongest adsorption capacity for contaminants (OSPAR, 2001)[1].

Analysis of the whole sediment (as undertaken in this investigation) provides an indication of the distribution of contaminant concentrations in bedded sediments. If sediments within a given area are predominately fine grained, the influence of grain size distribution is of minor importance, however in areas where grain size varies considerably, the distribution of contaminants will be closely related to the distribution of fine grained sediments, obscuring the true spatial distribution of contaminants (AMPS, 2004)[2].

Two different approaches are commonly used to correct for variable sediment composition:

- Contaminant concentrations may be normalised using components of the sediment that represent its affinity to bind contaminants (such as organic matter). Total Organic Carbon (TOC) is one of the most widely used ‘normalisers’ for organic contaminants; and
- Isolation of the fine fraction sediments (<63 µm) by sieving for physical grain size normalisation, effectively removing the coarse grained particulates which display a lower affinity to bind anthropogenic contaminants.

The objective of using normalisation techniques is to reduce the variability between samples arising from differences in sediment properties, such as grain size distribution. However, it is

[1] OSPAR (2009) Update of *JAMP guidelines for monitoring contaminants in sediment: Technical annex on normalisation of contaminant concentrations in sediment*
[2] AMPS (2004) *Discussion document on Sediment Monitoring Guidance for the EU Water Framework Directive, Version 2* May 2004

noted that the correlation between contaminant and co-factor concentrations may be weak or absent in some areas (OSPAR, 2009).

For organic contaminants, values are normalised to 1% organic carbon, as recommended in ANZECC/ ARMCANZ (2000).

5.5.2 Surface water

The assessment of risk to human health was undertaken in accordance with NEPC 2013 to account for recreational and marine ecological receptors. The adopted surface water assessment criteria are presented in Table C, Appendix B.

6. Results

6.1 General

This section presents the results of the sediment and surface water investigations undertaken on the site by GHD in March 2017.

Analytical results are summarised in the following tables in Appendix B:

- Table A: Sediment analytical results
- Table B: ASLP analytical results
- Table C: Surface water analytical results

6.2 Quality assurance and quality control

An evaluation of the field and laboratory data quality was undertaken in accordance with the NEPM – Schedule B2, Assessment of data quality. A QA/QC assessment is provided in Appendix E.

In summary, the review of the QA/QC program indicates that the surface water and sediment analytical data are of an acceptable quality upon which to draw meaningful conclusions regarding impacts to surface water and sediments in stormwater.

6.3 Sediment results

6.3.1 Field observations

The sediment samples were collected where possible within the stormwater channel in areas where sediment accumulated. All the samples (SS01 to SS03) were described as a silty sand, grey/black, very moist/wet with varying levels of organic matter.

6.3.2 Analytical results

Sediment samples were collected at locations SS01 to SS03. The sediment laboratory results presented in Figure 6, Appendix A and Table A, Appendix B. Laboratory certificates of analysis are presented in Appendix D.

Concentrations of PFAS in sediments were low and generally below or close to the laboratory limit of reporting. The maximum concentrations reported for PFOS and PFOA in sediments were 0.0024 mg/kg (SS01/DUP1) and 0.0003 mg/kg (SS01) respectively. PFHxS and PFOS (sum of total) was detected at concentrations greater than the LOR at all monitoring locations.

The following sediment locations had concentrations of other COPC greater than the adopted ANZECC ISQG:

- SS01 (and the inter and intra laboratory samples): zinc, lead, and copper.
- SS03: lead.

The concentration of pyrene, benz(a)anthracene, fluoranthene, and TRH C_{10} – C_{36} (sum of total) were detected at concentrations greater than the LOR at SS01.

6.3.3 ASLP analytical results

Three sediment samples were submitted for ASLP testing for PFAS. The leachate laboratory results are presented on Figure 7 in Appendix A, and summarised on Table B, Appendix B.

The concentration of PFHxS and PFOS (sum of total) was noted to be at least one order of magnitude greater in the leachate samples than in the sediment samples at each monitoring location. PFOS was noted to comprise 100% of the leachable PFAS.

6.4 Surface water results

6.4.1 Surface water quality

Prior to sampling, field parameters and observations were recorded during the sampling at each location. Field parameters are summarised in Table 6-1 (no field parameters were recorded for sample SP_450_01).

Table 6-1 Summary of surface water quality field parameters

Location	Dissolved Oxygen (ppm)	Electrical conductivity (uS/cm)	pH	Redox (mV)	Temperature (ºC)
SW01	7.09	279	7.95	287	22.2
SW02	7.16	272.1	7.66	307.6	22.2
SW03	7.91	265.4	8.06	300.2	22.3
SW04	7.06	269.6	7.88	293	22.2

* Oxidation Reduction Potential – field values converted to SHE; adjusted by +205.

All the sampling locations within the stormwater channel were described as having slight turbidity with an organic odour. The water within the channel was observed to be moderately flowing. The sample from the outlet pipe (SP_450_01) of the FRNSW site was described as very clear with a slight chemical odour.

6.4.2 Analytical results

Surface water samples were collected at five locations (SW01 to SW04 and SP_450_01). The surface water laboratory results and guideline exceedances are presented in Figure 5, Appendix A and Table C, Appendix B. Laboratory certificates of analysis are presented in Appendix D.

The following surface water locations exceeded the nominated PFAS screening criteria for surface water:

- SW01 (and inter laboratory sample), SW02, SW03, SW04 and SP_450_01 exceeded the Draft ANZECC ecological guidelines for PFOS. However, the concentration of PFOS was noted to be below the LOR and equal to the LOR at SW01 (primary and duplicate samples) and SW04 respectively.
- SP_450_01 (FRNSW site outlet pipe), exceeded the FSANZ recreational guideline.

The concentration of PFAS at SW01 (up gradient of the site) was noted to be less than the LOR for all analytes, where as the remaining sample points (all down gradient of the site) each had some detects of PFAS.

All sampling locations exceeded the NEPM 2013 GIL freshwater guideline for copper, lead and zinc. All the concentrations are within a similar order of magnitude.

The concentrations of TRH, BTEX and PAHs were less than the LOR at each monitoring location.

7. Discussion

A range of analytes were assessed as part of this investigation in response to EPA requests and guidance. These were compared against the nominated assessment criteria based on the identified potential receptors. However, as outlined in section 1.2, the objective of this report is off-site migration of potential PFAS impact originating from the site via surface water flows. Exceedances of the adopted assessment criteria not related to PFAS contamination have been noted in section 6 (results) and have not been considered further with the primary focus of this investigation being PFAS.

7.1 Sediment

PFAS in sediments

The concentration of PFAS in sediments were low with the results generally being less than the LOR for majority of the PFAS analytes. However, PFHxS and PFOS (sum of total) was detected at all monitoring locations.

The results of the sediment sampling confirm that the sediments within the stormwater channel have been impacted by PFAS which is likely to be associated with fire fighting activities at the site. Additionally, the presence of PFAS in sediments in the stormwater channel (Shaes Creek) indicated that impacted sediments from the site are likely to be migrating off-site.

PFAS leachability from sediments

The most important process by which PFASs present in soil may pose a risk to people or the environment is contamination of surface and groundwater's from leaching from the soil (NSW EnRiskS, 2016)

Despite the low concentration of PFAS in all sediment samples, leachate testing completed on these samples shows that there is potential for the release of PFAS to the surface water environments. The presence of PFAS in sediments therefore represents a possible on-going source of PFAS to the environment.

7.2 Surface water

Samples SW01 to SW04 were collected from the stormwater channel/Sheas Creek under relatively stable conditions. Sample SP_450_01 was taken after the other four samples from a stormwater pipe with water flowing from the site surface after a flow simulation. This water then entered the stormwater channel/Sheas Creek where samples SW01 to SW04 were previously collected.

The highest concentration of PFAS was reported in sample SP_450_01. The surface water concentrations within the stormwater channel were relatively low for PFAS compared to the drainage pipe from the site surface, indicating that the training facility is likely to be the primary source of PFAS contamination for surface water. This is further supported by the lack of PFAS in up-gradient sample, SW01. Additionally, the low concentrations of PFAS in the stormwater channel indicates that there is little retention of PFAS impacted water from the site along the channel. This body of water sampled as SP_450_01 is therefore expected to move rapidly to down-gradient water bodies such as Alexandria Canal and possibly the Cooks River and/or Botany Bay. The extent of this migration beyond the canal and the effects of dilution may require further investigation.

7.3 EPA site prioritisation

EnRisk (2016) presents a decision tree process and trigger points to enable prioritisation of sites based on the findings of investigation. Trigger points for soil leachate and surface water as reported by EnRisk (2016), are summarised below with reference to the analytical data collected during this preliminary stage of assessment. For the purpose of this ranking and in the absence of sediment trigger values, sediment leachate data has been assessed against the soil leachate trigger points.

Sediment leachate data

- Trigger point 1: Soil leachate data reported above 100 µg/L[2]
- Trigger point 2: Soil leachate data reported above 1 µg/L

The maximum total PFAS concentration reported for sediment leachate data was 0.03 µg/L collected from SS01, classifying the site as a 'Priority 3 site' under the EnRisk (2016) decision tree process based on soil leachate data.

Surface water data

- Trigger point 1 (elevated contamination): Groundwater or surface water data reported above 10 µg/L[3]
- Trigger point 2: Groundwater or surface water data reported between 0.1 µg/L to 10 µg/L
- Trigger point 3 (low levels of contamination): Groundwater or surface water data reported between 0.05 µg/L to 0.1 µg/L

The maximum total PFAS concentration reported for surface water was 1.53 µg/L in SP_450_01. Based on review of the surface water data, the site would be classified as a priority 2 site (where the surface water results are above trigger point 2).

7.3.1 Overall prioritisation of the site

As outlined above, sediment leachate and surface water analytical data would classify the site as a priority 2 site for further investigation based on the data reported during the sampling. Surface water data indicated that the site should be classified as priority 2 owing to the presence of total PFAS concentrations exceeding trigger point 2. The conclusions and recommendations made in Section 9 of this report take into account this prioritisation.

It should be noted that soil and groundwater analysis was not conducted as part of this preliminary investigation (outside of scope objectives). The site prioritisation determined above may therefore change subject to further site investigation.

[2] Trigger points values can be applied to PFOS alone or to the sum of PFAS as discussed by EnRisk (2016)
[3] Trigger points values can be applied to PFOS alone or to the sum of PFAS as discussed by EnRisk (2016)

8. Conceptual site model

It is noted that the primary objective of this investigation is to assess the off-site migration of potential PFAS impact originating from the site via surface water flows. The primary contaminants of potential concern (COPC) are therefore PFAS, notably PFOS and PFOA, which were components of AFFF. Additionally, only surface water and sediments were assessed as part of this investigation. The revised conceptual site model (CSM) therefore concentrates primarily on PFAS as the main COPC for the site, and focuses on off-site receptors.

Based on the sampling analytical results, the CSM from the PSI (GHD, 2016) has been refined. The potential source-pathway-receptor linkages are summarised below (Table 8-1).

8.1 Sources

At the time of the investigations (March 2017), the site was occupied by FRNSW and used by staff as a firefighting training site. Based on the findings of the PSI (GHD, 2016) and the results of intrusive investigations, the following primary sources of contamination and associated COPC were identified:

- The training pad in the south-west corner of site, near the current training gas props, and the large high rise tower training prop where most firefighting foams and fuel for ignition are likely to have been used.
- Designated storage of AFFF and locations where extinguishers were filled.
- Drainage or containment components (underground water tank) receiving AFFF contaminated wastewater at designated equipment wash down areas after foam was used for firefighting training.
- The former fuel underground storage tanks and minor spills of petroleum hydrocarbons and oils from vehicles traversing the site. The primary contaminants of concern are expected to include petroleum hydrocarbons and polycyclic aromatic hydrocarbons.

Soil and groundwater were not assessed as part of this investigation, therefore a number of these sources have not been individually assessed since identification in the PSI (GHD, 2016).

Impacted sediments which have migrated from the main source zones (including to off-site locations), with subsequent leaching of PFAS, represent a secondary source of contamination.

Considering that the most up gradient surface water sample in this investigation (SW01) did not contain PFAS, up-gradient activities along Sheas Creek are unlikely to represent a significant source of PFAS.

8.2 Receptors

When evaluating potential adverse health / environmental effects from exposure to a contaminated site, all potentially exposed populations should be considered. For this site, the key populations or receptors of interest are considered to include those identified in Section 5.2.

8.3 Exposure pathways

The primary pathways by which receptors could be exposed to the sources of contamination outlined above are considered to be:

- Dermal contact with contaminated media.
- Ingestion of contaminated media.

- Terrestrial/aquatic animal consumption of impacted animals, water, soils and plants (secondary pathway).
- Inhalation of contaminated soils or dust and water (aquatic animals). (PFAS are not considered to be a vapour hazard due to their low volatility).
- Vertical and horizontal migration of contaminated liquid through the unsaturated zone into the saturated zone, and subsequent horizontal migration within the groundwater and subsequent discharge to surface waters. The US EPA (2014) notes that PFAS are water soluble and can migrate readily from soil to groundwater, where they can be transported long distances.
- Surface runoff and sediment transport into storm water drainage and subsequent transport and discharge to surface waters. This may be enhanced during significant rain events.

Schedule B2 of the NEPM (2013) states that "As a preliminary screening measure, the potential for a vapour intrusion risk should be considered where the Henry's law constant for a substance is greater than 1 x 10^{-5} atm/m^3/mol and its vapour pressure is > 1 mm Hg at room temperature". US EPA (2014) list Henry's law constants for PFOS and PFOA of 3.05 x10^{-9} atm/m^3/mol and 'not measurable' respectively, which based on the NEPM (2013) recommendation, suggests inhalation of vapours from these contaminants is unlikely to represent a human health risk at the site.

US EPA (2014) notes that once PFOS and PFOA are released to the atmosphere they are expected to absorb on to particles and settle to the ground through wet and dry deposition.

8.3.1 PFAS fate and transport

PFAS forms a component of AFFF, which is sprayed onto fires during training events. The mode of use of AFFF through roof monitors and hoses allows for it to spread through airborne dispersion beyond the training area. Typically, this results in diffuse low levels of PFAS over a wider area. Generally, the highest soil concentrations tend to be at the point source.

PFAS are stable and persistent compounds that do not readily degrade in the environment.

Once in soil, PFAS can leach from soil to water (due to its solubility in water) as water migrates downward through soil to the water table, resulting in contaminated groundwater. Generally, the shorter chain PFAS species are more soluble than the longer chain PFAS. Groundwater will migrate and discharge into the nearest down-gradient surface water body – in the case of the site, the main discharge area is likely to be Sheas Creek located in the south-western corner of the site.

The surface water on-site collects in the on-site drainage that collects within the underground water tank location in the south of the site. This then is assumed to overflow into Sheas Creek culvert. Shaes Creek then discharges into Alexandria Canal, the Cooks River and Botany Bay, which are increasingly marine environments.

Studies have indicated that as fresh water contacts seawater, PFASs can partition into sediments suggesting a significant mass of dissolved phase PFASs may partition into the sediment rather than become dissolved in seawater (You et al 2010, Zhang and Lerner 2012). This, combined with tidal effects, makes the discharge mechanisms in coastal regions very complex. Benthic organisms living in the sediment may then be impacted through ingestion of the sediments.

Migration through the soil will depend on the attenuation properties of the soil. Some components of the soil (notably organic carbon) can sorb PFAS components. Generally, the longer chain PFAS species will sorb more readily. This, combined with the lower solubility of the

longer PFAS species, can result in mainly shorter chain PFAS species being dissolved in water while the large molecules remain in the soil.

Plants (including aquatic plants) have the ability to uptake PFAS in through impacted soil water. Grasses and other flora can be consumed by micro- and macro-fauna which may in turn be predated. In terms of risks to ecological receptors, while contamination can give rise to direct toxic effects on ecosystems, the limiting factor can be the bioaccumulation of contaminants in fish or other species affecting persons or other animals that consume these fish or other species.

The main risks to human health mainly arise through ingestion of impacted media i.e. soil, water or organisms.

8.3.2 Source-pathway-receptor linkages

Based on the current information and considering the objective of this investigation, the following CSM has been developed in Table 8-1 .

Table 8-1 Updated CSM

Potential source	Primary pathway	Receptor	Pathway present?
Soils/sediments in firefighting training areas contaminated with PFAS (training pad, high-rise tower training prop, and AFFF storage areas).	Dermal contact and/or ingestion	On-site commercial workers, intrusive maintenance workers, terrestrial and aquatic ecology	Unknown – PFAS soil impact was not assessed as part of this assessment
	Vertical/horizontal migration of leachate through unsaturated zone	Groundwater – subsequent migration in groundwater (secondary)	Unknown – PFAS soil and groundwater impact was not assessed as part of this assessment
	Surface runoff inducing sediment transport	Surface waters (including drainage systems – secondary pathway) and associated ecology	Yes – PFAS detected in sediment samples from the drainage system (Sheas Creek) which was shown to have a leachable portion of PFAS.

Potential source	Primary pathway	Receptor	Pathway present?
Surface water contaminated with PFAS (from the site in Shaes Creek).	Dermal contact and/or ingestion	On-site commercial workers, intrusive maintenance workers	Unlikely – PFAS impact in surface water from the storm water canal detected, however this is not likely to be used as a drinking water source considering its tidal nature and the general setting of the site in an urbanised commercial area with access to reticulated water supplies. Additionally, the canal has restricted access preventing accidental dermal contact with water from the canal.
	Surface runoff and sediment transport	Ecology of down-gradient surface water bodies (Cooks River and Botany Bay).	Likely – PFAS impact in surface water exceeded the ecological guidelines in most samples in the canal. This is likely to flow into down gradient surface water bodies.
		Recreational users of down-gradient surface water bodies (Cooks River and Botany Bay)	Likely – PFAS impact in surface water exceeded the recreational guidelines in SP_450_01. Water from this sample location is likely to flow into down gradient surface water bodies, however no investigation was undertaken off-site to assess dilution factors during periods of high flow from the site.
Contaminated groundwater (secondary source)	Vertical/horizontal migration	Down gradient surface waters recharged by groundwater	Unknown – PFAS soil and groundwater impact was not assessed as part of this assessment

Potential source	Primary pathway	Receptor	Pathway present?
		Abstraction bores (domestic use)	Unknown – PFAS soil and groundwater impact was not assessed as part of this assessment
Contaminated soils and groundwater from former fuel underground storage tanks and minor spills of petroleum hydrocarbons and oils from vehicles traversing the site (historic and current, TRH, BTEX and PAH)	Dermal contact and ingestion and/or Inhalation of vapours and/or Vertical/horizontal migration through unsaturated zone	FRNSW training facility commercial workers, intrusive maintenance workers and/or groundwater	Unknown – soil and groundwater impact was not assessed as part of this assessment

9. Conclusions and recommendations

9.1 Conclusions

The overall objective of this investigation was to assess the off-site migration of potential PFAS impact originating from the site via surface water flows. Based on the scope of works presented in Section 1.3 of this report, the findings of the investigation and subject to the limitations presented in Section 11, the following conclusions are made:

- The concentration of PFAS in sediments were low, however PFAS was detected at all monitoring locations. The results of the sediment sampling confirm that the sediments within the stormwater channel have been impacted by PFAS, and that impacted sediments from the site have the potential to migrate off-site. The presence of PFAS in sediments represents a potential on-going source for surface water receptors.
- Leachability testing confirmed that sediments have the potential to release PFAS to the environment.
- All surface water samples collected in the stormwater channel exceeded the ecological guidelines for PFAS.
- The stormwater outlet pipe from the FRNSW site discharging into the stormwater channel reported the highest concentrations of PFAS (SP_450_01), which exceeded the ecological and recreational water guidelines. The low concentrations of PFAS in the stormwater channel indicates that there is little retention of PFAS impacted water from the site along the channel. This body of water sampled as SP_450_01 is therefore expected to move rapidly to down-gradient water bodies such as Alexandria Canal and possibly the Cooks River and/or Botany Bay.
- Based on the EnRisk (2016) decision tree process for prioritisation, the site is currently classified as a priority 2 site based on detections of PFAS in surface water on site. It is important to note that the trigger point system has not been designed to be protective of all risks to people or the environment but is designed to assist with prioritisation of sites for further assessment and management. Additionally, soil and groundwater was not assessed as part of this investigation, and results from these media may change the site prioritisation.

9.2 Recommendations

Based on the findings of these works, GHD recommends consideration of management actions which can be implemented to address the mass of PFAS present on site and minimise further migration. These management actions may include, but not be limited to:

- Assess and implement measures to stop (or minimise) the off-site discharge of surface waters from the site.
- Where off-site discharge is permitted it should be managed, where applicable, in accordance with the relevant operational approval, licence or permit.
- Additional groundwater and surface water sampling should be undertaken following the implementation of any management actions. Sampling should be undertaken to accommodate seasonal fluctuation, for example, following rainfall events.
- Additional soil sampling at areas not previously assessed (e.g. Douglas Partners 2015) be undertaken to identify PFAS impacted locations and inform migration pathways.

10. References

ANZECC (2000). National Water Quality Management Strategy, Paper No. 4, Australian and New Zealand Guidelines for Fresh and Marine Water Quality, October 2000,

Australian and New Zealand Environment and Conservation Council (ANZECC) and Agriculture and Resource Management Council of Australia and New Zealand (ARMCANZ).

AS4482 (1999 and 2005). Guide to the investigation and sampling of sites with potentially contaminated soil.

AS/NZS5567.11 (1998). Water Quality – Sampling – Guidance on the sampling of groundwater.

ASRIS (2013) Australian Soil Resource Information System, 2013

Australian and New Zealand Environmental Conservation Council (ANZECC & ARMCANZ 2000) *Australian and New Zealand Guidelines for Fresh and Marine Water Quality*

City of Sydney Local Environment Plan, 2012.

Department of Water Resources (1987) Groundwater in New South Wales: Assessment of *Pollution Risk*. Department of Water Resources, Sydney, NSW

DER (2016); Interim Guideline on the Assessment and Management of Perfluoroalkyl and *Polyfluoroalkyl Substances (PFAS), Contaminated Site Guidelines;* WA Department of Environment Regulations Perth, Western Australia.

EnRisk (2016) *Proposed decision tree for prioritising sites potentially contaminated with PFAS.* 25 February 2016

GHD (2016) *Alexandria PFAS Investigation, Preliminary Site Investigation and Sampling and Analysis Quality Plan.* August 2016.

National Health and Medical Research Council (NHMRC & NRMMC 2011) *Australian Drinking Water Guidelines*

National Health and Medical Research Council (NHMRC 2008) *Guidelines for Managing Risk in Recreational Waters*

National Uniform Drillers Licensing Committee (2011) *Minimum Construction Requirements for Water Bores in Australia* (Edition 3, 2012)

NEPC (2013) National *Environmental Protection (Assessment of Site Contamination) Amended Measure (NEPM) No. 1 – Schedule B1, Guideline on Investigation Levels for Soil and Groundwater*

NSW DEC, 2006; Contaminated Sites: Guidelines for NSW Site Auditor Scheme

NSW DECC, 2009; *Guidelines on the Duty to Report Contamination under the Contaminated Land Management Act 1997*

NSW EPA, 1995; Contaminated Sites: Sampling Design Guidelines

Office of Environment and Heritage (OEH), 2011; Contaminated Sites: Guidelines for Consultants Reporting on Contaminated Sites

US EPA, 2014; Emerging Contaminants – Perfluorooctane Sulfonate (PFOS) and *Perfluoroactanoic Acid (PFOA), Emerging Contaminants Fact Sheet – PFOS and PFOA*

US EPA, 2014a; *Health Effects Document for Perfluorooctanoic Acid (PFOA)*; US EPA Washington DC, United States.

US EPA, 2014b; *Health Effects Document for Perfluorooctane Sulfonate (PFOS)*; US EPA Washington DC, United States

11. Limitations

This report has been prepared by GHD for Fire & Rescue NSW and may only be used and relied on by Fire & Rescue NSW for the purpose agreed between GHD and the Fire & Rescue NSW as set out in this report.

GHD otherwise disclaims responsibility to any person other than Fire & Rescue NSW arising in connection with this report. GHD also excludes implied warranties and conditions, to the extent legally permissible.

The services undertaken by GHD in connection with preparing this report were limited to those specifically detailed in the report and are subject to the scope limitations set out in the report.

The opinions, conclusions and any recommendations in this report are based on conditions encountered and information reviewed at the date of preparation of the report. GHD has no responsibility or obligation to update this report to account for events or changes occurring subsequent to the date that the report was prepared.

The opinions, conclusions and any recommendations in this report are based on assumptions made by GHD described throughout this report. GHD disclaims liability arising from any of the assumptions being incorrect.

Where data supplied by Fire & Rescue NSW or other external sources, including previous site investigation data and site plans, have been used, it has been assumed that the information is correct unless otherwise stated. No responsibility is accepted by GHD for incomplete or inaccurate data supplied by others.

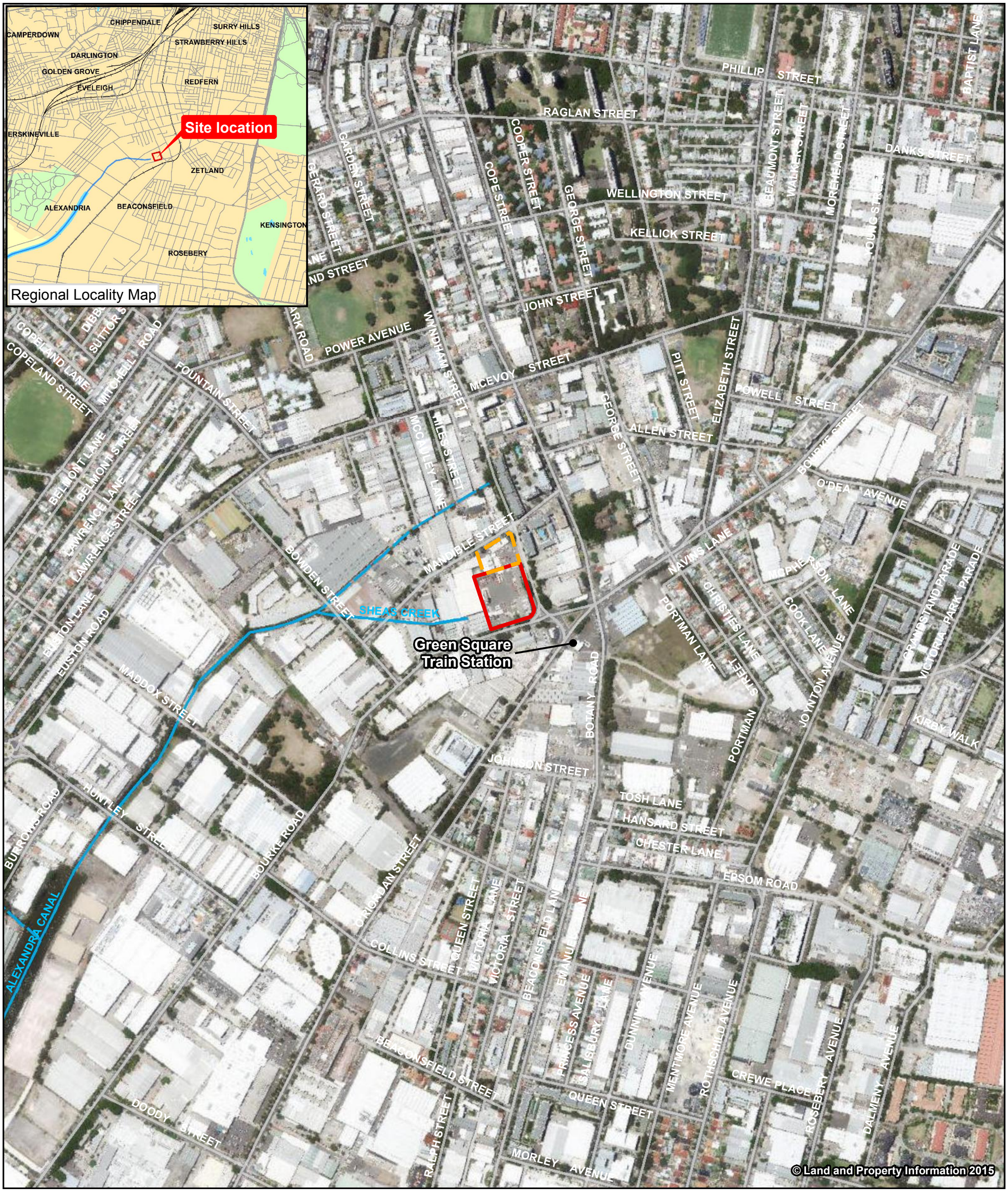
The opinions, conclusions and any recommendations in this report are based on information obtained from, and testing undertaken at or in connection with, specific sample points. Site conditions at other parts of the site may be different from the site conditions found at the specific sample points.

Investigations undertaken in respect of this report are constrained by the particular site conditions, such as the location of buildings, services and vegetation. As a result, not all relevant site features and conditions may have been identified in this report.

Site conditions (including the presence of hazardous substances and/or site contamination) may change after the date of this Report. GHD does not accept responsibility arising from, or in connection with, any change to the site conditions. GHD is also not responsible for updating this report if the site conditions change.

Appendices

Appendix A – Figures



LEGEND

- Site Boundary
- Sydney Trains - Former FRNSW Site
- Streets
- Major Waterways
- Minor Waterways

Paper Size A4

0 50 100 200 300

Metres

Map Projection: Transverse Mercator
Horizontal Datum: GDA 1994
Grid: GDA 1994 MGA Zone 56

N

Fire & Rescue NSW
Alexandria Site Investigation

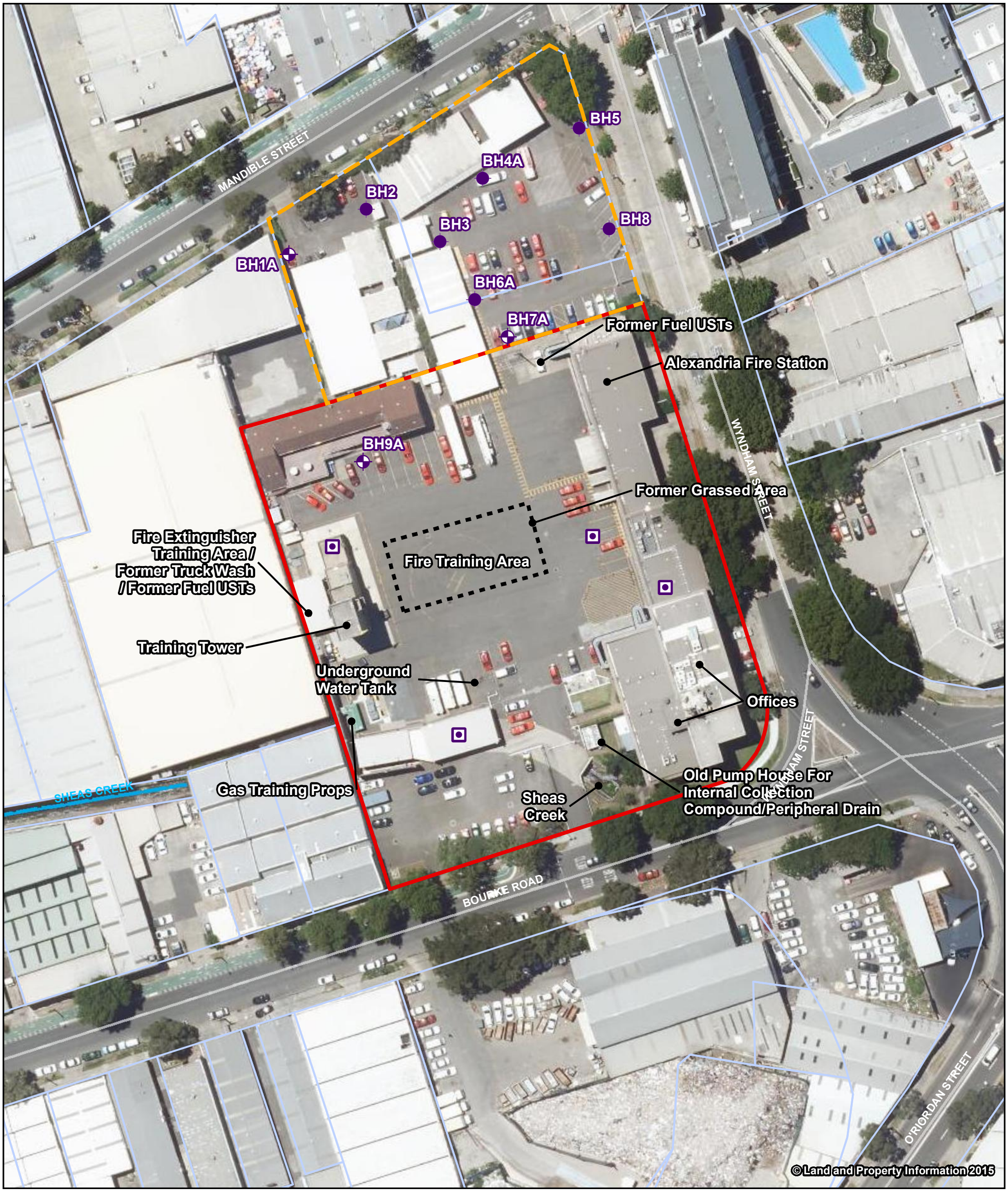
Site Location and Key Off-site Receptors

Job Number	21-25583
Revision	A
Date	03 Apr 2017

Figure 1

G:\21\25583\GIS\Maps\Deliverables\Alexandria\21_25583_Z001_Alexandria_SiteLocation.mxd Level 15, 133 Castlereagh Street Sydney NSW 2000 **T** 61 2 9239 7100 **F** 61 2 9239 7199 **E** sydmail@ghd.com.au **W** www.ghd.com.au

Data source: Imagery - ©Land and Property Information (Extracted: 03/04/17); Streets, Waterways - NSW LPI 2012 DTDB. Created by:tnham



LEGEND

- Site Boundary
- Sydney Trains - Former FRNSW Site
- Historical Foam Storage Areas
- Borehole (DP, 2015)
- Monitoring Well (DP, 2015)
- Cadastre
- Streets
- Major Waterways
- Minor Waterways

Paper Size A4

0 5 10 20 30 40

Metres

Map Projection: Transverse Mercator
Horizontal Datum: GDA 1994
Grid: GDA 1994 MGA Zone 56

N

Fire & Rescue NSW
Alexandria Site Investigation

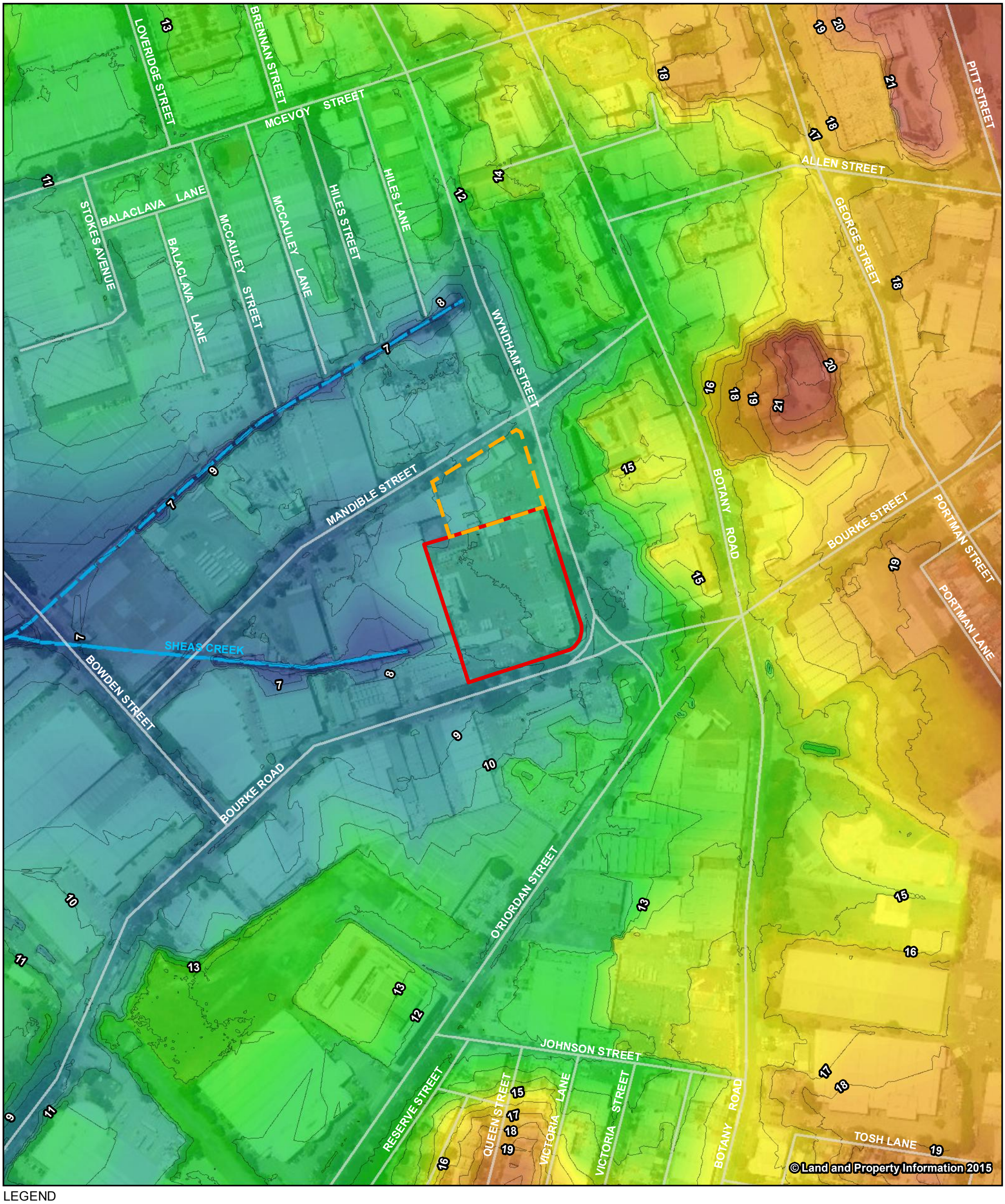
Job Number 21-25583
Revision A
Date 03 Apr 2017

Site Layout

Figure 2

G:\21\25583\GIS\Maps\Deliverables\Alexandria\21_25583_Z002_Alexandria_SiteLayout.mxd Level 15, 133 Castlereagh Street Sydney NSW 2000 **T** 61 2 9239 7100 **F** 61 2 9239 7199 **E** sydmail@ghd.com.au **W** www.ghd.com.au

Data source: Imagery - ©Land and Property Information (Extracted: 03/04/17); Streets, Waterways - NSW LPI 2012 DTDB. Created by:tnham



LEGEND

- Site Boundary
- Sydney Trains - Former FRNSW Site
- Streets
- Contours
- Major Waterways
- Minor Waterways

Value

High : 24.305

Low : 4.365

Paper Size A4

0 10 20 40 60 80 100

Metres

Map Projection: Transverse Mercator
Horizontal Datum: GDA 1994
Grid: GDA 1994 MGA Zone 56

N

GHD

Fire & Rescue NSW
Alexandria Site Investigation

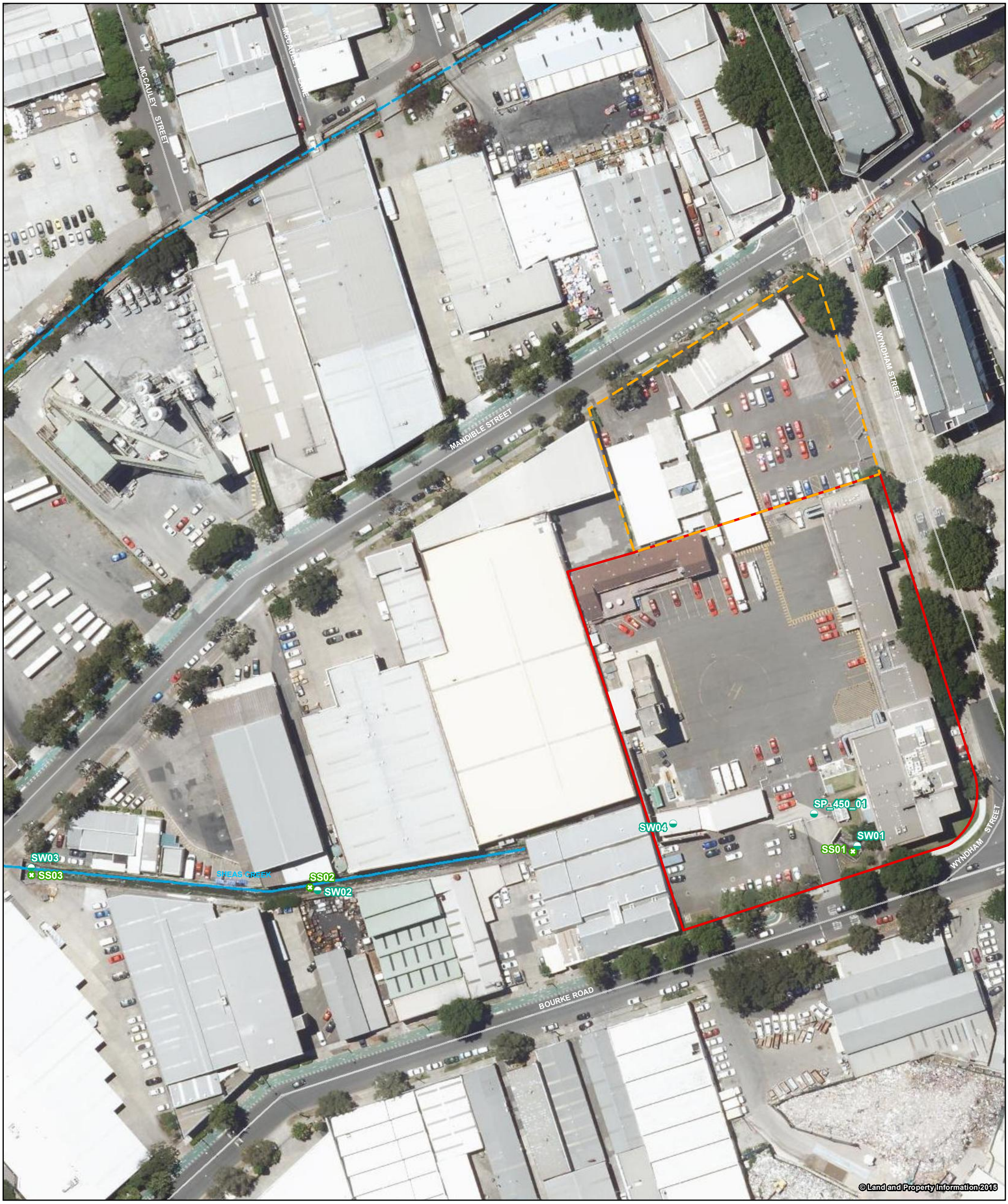
Job Number 21-25583
Revision A
Date 03 Apr 2017

Elevation

Figure 3

Level 15, 133 Castlereagh Street Sydney NSW 2000 **T** 61 2 9239 7100 **F** 61 2 9239 7199 **E** sydmail@ghd.com.au **W** www.ghd.com.au

Data source: Imagery - ©Land and Property Information (Extracted: 03/04/17); Streets, Waterways - NSW LPI 2012 DTDB; LIDAR - NSW LPI. Created by:tnham



LEGEND

- Site Boundary
- Sydney Trains - Former FRNSW Site
- Streets
- Major Waterways
- Minor Waterways
- Proposed Sediment Sample (3)
- Proposed Surface Water Sample (5)

Paper Size A3

0 5 10 20 30 40

Metres

Map Projection: Transverse Mercator
Horizontal Datum: GDA 1994
Grid: GDA 1994 MGA Zone 56

N

Fire & Rescue NSW
Alexandria Site Investigation

Job Number 21-25583
Revision A
Date 03 Apr 2017

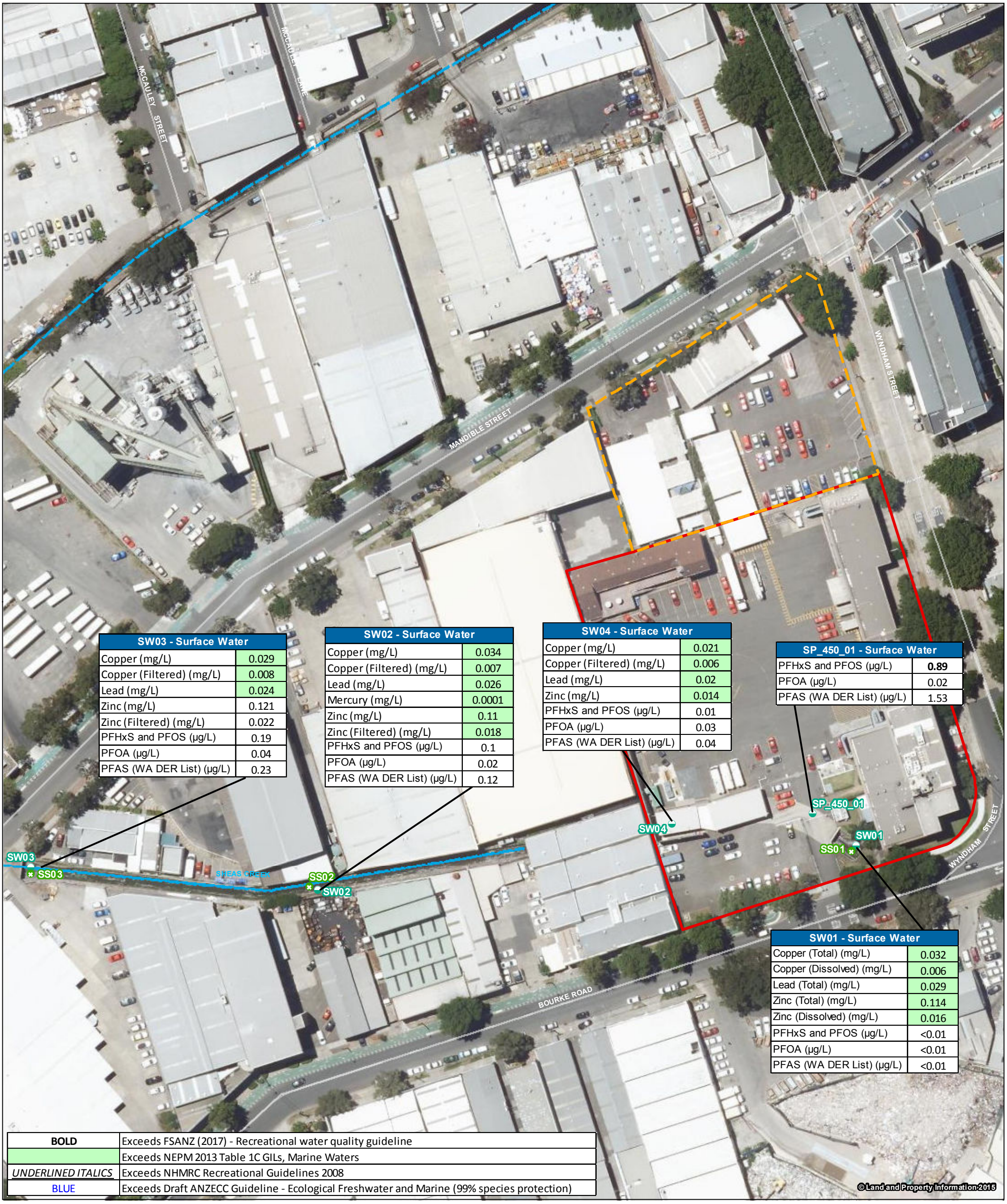
Investigation Locations

Figure 4

G:\21\25583\GIS\Maps\Deliverables\Alexandria\21_25583_Z004_Alexandria_InvestigationLocations.mxd

Level 15, 133 Castlereagh Street Sydney NSW 2000 **T** 61 2 9239 7100 **F** 61 2 9239 7199 **E** sydmail@ghd.com.au **W** www.ghd.com.au

Data source: Imagery - ©Land and Property Information (Extracted: 03/04/17); Streets, Waterways - NSW LPI 2012 DTDB. Created by:tnham



LEGEND

- Site Boundary
- Sydney Trains - Former FRNSW Site
- Streets
- Major Waterways
- Minor Waterways
- Sediment Sample (3)
- Surface Water Sample (5)

Paper Size A3

0 5 10 20 30 40

Metres

Map Projection: Transverse Mercator
Horizontal Datum: GDA 1994
Grid: GDA 1994 MGA Zone 56

N

Fire & Rescue NSW
Alexandria Site Investigation

Job Number 21-25583
Revision A
Date 26 Apr 2017

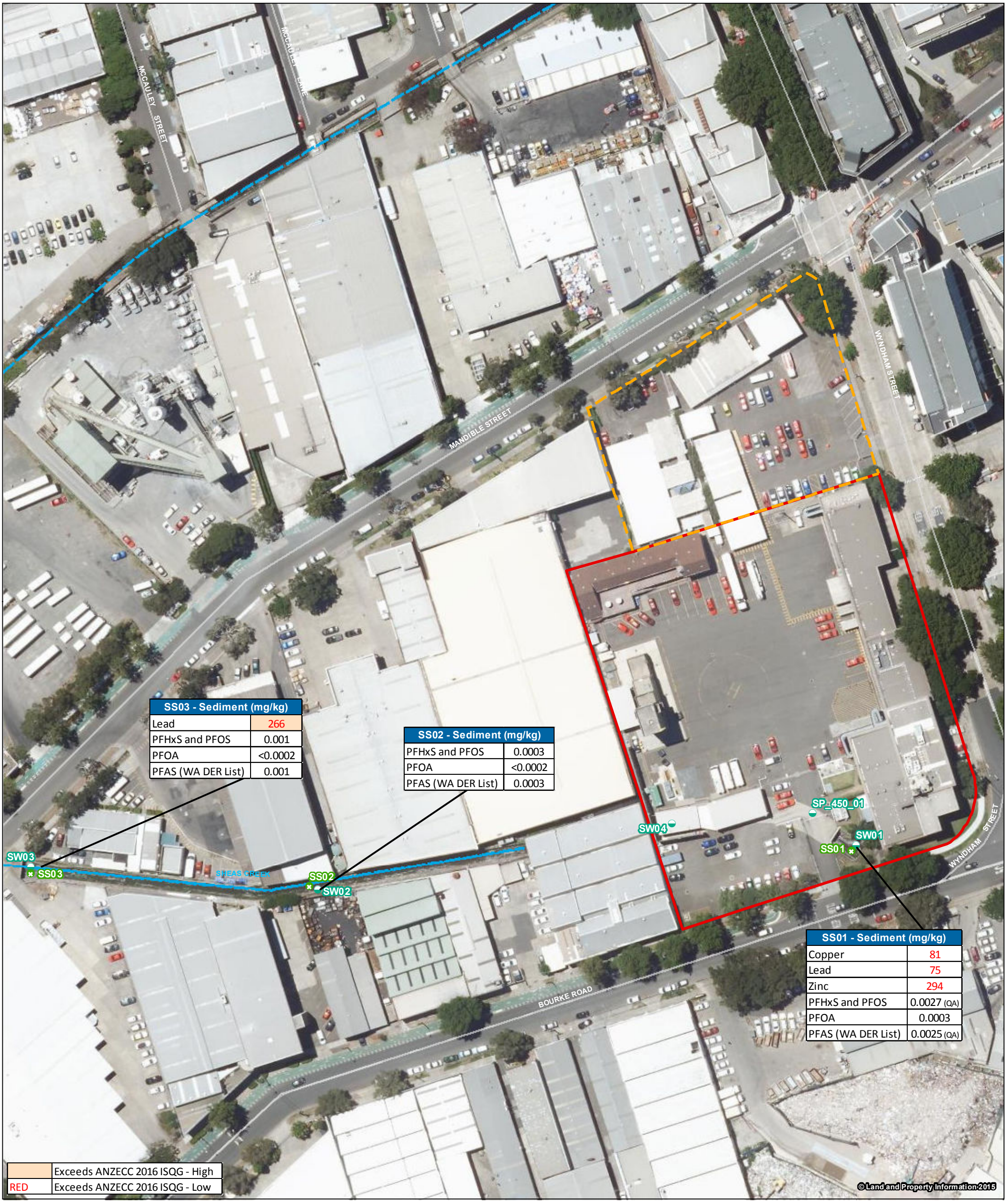
Surface Water Exceedances

Figure 5

\\ghdnet\ghd\AU\Sydney\Projects\21\25583\GIS\Maps\Deliverables\Alexandria\21_25583_Z005_Alexandria_Water_Exceedances.mxd

Level 15, 133 Castlereagh Street Sydney NSW 2000 T 61 2 9239 7100 F 61 2 9239 7199 E sydmail@ghd.com.au W www.ghd.com.au

Data source: Imagery - ©Land and Property Information (Extracted: 26/04/17); Streets, Waterways - NSW LPI 2012 DTDB. Created by:mking3



LEGEND

- Site Boundary
- Sydney Trains - Former FRNSW Site
- Streets
- Major Waterways
- Minor Waterways
- Proposed Sediment Sample (3)
- Proposed Surface Water Sample (5)

Paper Size A3

0 5 10 20 30 40

Metres

Map Projection: Transverse Mercator
Horizontal Datum: GDA 1994
Grid: GDA 1994 MGA Zone 56

N

GHD

Fire & Rescue NSW
Alexandria Site Investigation

Job Number 21-25583
Revision A
Date 26 Apr 2017

Sediment Exceedances

Figure 6

\\ghdnet\ghd\AU\Sydney\Projects\21\25583\GIS\Maps\Deliverables\Alexandria\21_25583_Z006_Alexandria_Sediment_Exceedances.mxd

Level 15, 133 Castlereagh Street Sydney NSW 2000 **T** 61 2 9239 7100 **F** 61 2 9239 7199 **E** sydmail@ghd.com.au **W** www.ghd.com.au

Data source: Imagery - ©Land and Property Information (Extracted: 26/04/17); Streets, Waterways - NSW LPI 2012 DTDB. Created by:mking3

SS03 - ASLP (µg/L)	
PFHxS and PFOS	0.01
PFOA	<0.01
PFAS (WA DER List)	0.01

SS02 - ASLP (µg/L)	
PFHxS and PFOS	0.01
PFOA	<0.01
PFAS (WA DER List)	0.01

SS01 - ASLP (µg/L)	
PFHxS and PFOS	0.03
PFOA	<0.01
PFAS (WA DER List)	0.03

LEGEND

- Site Boundary
- Sydney Trains - Former FRNSW Site
- Streets
- Major Waterways
- Minor Waterways
- Sediment Sample (3)
- Surface Water Sample (5)

Paper Size A3

0 5 10 20 30 40

Metres

Map Projection: Transverse Mercator
Horizontal Datum: GDA 1994
Grid: GDA 1994 MGA Zone 56

N

Fire & Rescue NSW
Alexandria Site Investigation

Job Number 21-25583
Revision A
Date 26 Apr 2017

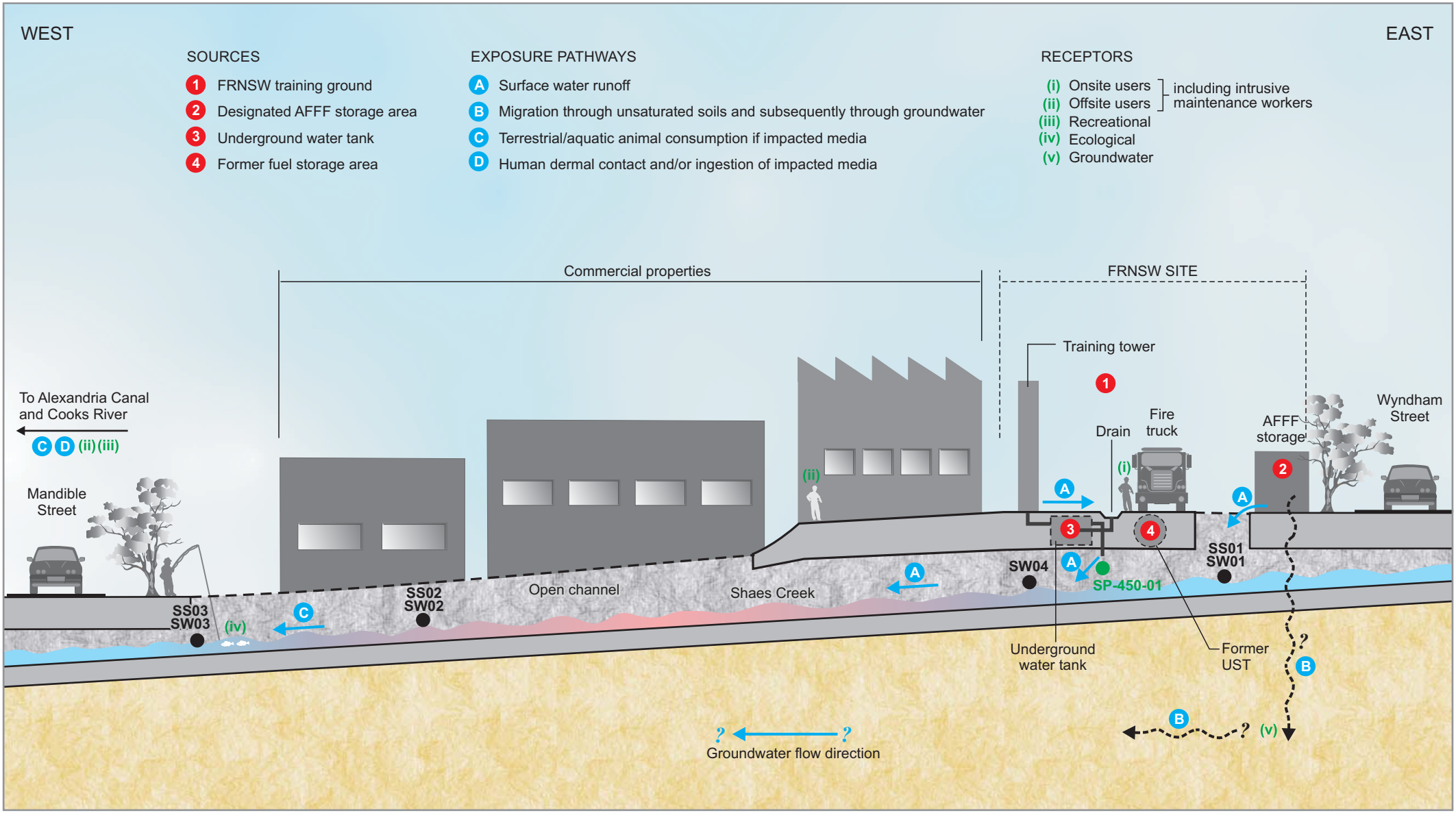
ASLP laboratory results

Figure 7

\\ghdnet\ghd\AU\Sydney\Projects\21\25583\GIS\Maps\Deliverables\Alexandria\21_25583_Z007_Alexandria_ASLP_Exceedances.mxd

Level 15, 133 Castlereagh Street Sydney NSW 2000 **T** 61 2 9239 7100 **F** 61 2 9239 7199 **E** sydmail@ghd.com.au **W** www.ghd.com.au

Data source: Imagery - ©Land and Property Information (Extracted: 26/04/17); Streets, Waterways - NSW LPI 2012 DTDB. Created by:mking3



Conceptual diagram only - not to scale

LEGEND
- Concrete
- Fill
- Sand
- PFAS impact
- Surface water flow
- Vapour migration

Fire & Rescue NSW
Alexandria Training Facility

Conceptual Site Model

Job Number	21-25583
Revision	A
Date	27 Apr 2017

Figure 8

Level 15, 133 Castlereagh Street Sydney NSW 2000 **T** 61 2 9239 7100 **F** 61 2 9239 7199 **E** sydmail@ghd.com **W** www.ghd.com

Appendix B – Analytical results summary tables

Appendix B
Table A
Sediment analytical results

					Cations					TOC	Unassigned	Inorganics							Metals								TRH - NEPM 2013							TRH -
					Exchangeable Calcium	Exchangeable Magnesium	Exchangeable Potassium	Exchangeable Sodium	CEC	Total Organic Carbon	TCLP Fluid	pH (Final)	pH (Initial)	Moisture	Moisture Content (dried @ 103°C)	pH (aqueous extract)	pH (Lab)	pH (after HCL)	Arsenic	Cadmium	Chromium (III+VI)	Copper	Lead	Mercury	Nickel	Zinc	C6-C10 minus BTEX (F1)	C6 - C10 Fraction	>C10-C16 minus Naphthalene (F2)	>C10 - C16 Fraction	>C16 - C34 Fraction (F3)	>C34 - C40 Fraction (F4)	>C10 - C40 (Sum of Total)	C6 - C 9 Fraction	C10 - C14 Fraction	C15 - C28 Fraction
					meq/100g	meq/100g	meq/100g	meq/100g	meq/100g	%	mg/kg	pH Units	pH Units	%	%	pH Units	pH Units	pH Units	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg
EQL					0.2	0.2	0.2	0.2	0.2	0.5	1	0.1	0.1	1	1	0.1	0.1	0.1	5	1	2	5	5	0.1	2	5	10	10	50	50	100	100	50	10	50	100
ANZECC 2016 ISQG -High																			70	10	370	270	220	1	52	410									
ANZECC 2016 ISQG -Low																			20	1.5	80	65	50	0.15	21	200									
Field_ID	**Location_Code**	**Sample_Depth_Range**	**Sampled_Date_Time**	**Sample_Type**																															
DUP1	SS01		15/03/2017	Field_D	3.4	<0.2	<0.2	<0.2	3.4	1.2	1	5.1 - 8.5	8	27.6	-	-	7.5	1.6	<5	<1	6	58	48	<0.1	5	207	<10	<10	<50	<50	250	120	370	<10	<50	180
SPLIT 1	SS01		15/03/2017	Interlab_D	-	-	-	-	-	1.6	-	-	-	-	27	7	-	-	2.6	<0.4	7.7	52	54	<0.1	6.1	210	<20	<20	<50	<50	<100	<100	-	<20	<20	55
SS01	SS01		15/03/2017	Normal	1.6	<0.2	<0.2	<0.2	1.6	1.7	1	5.1 - 8.2	8.2	26.6	-	-	7.5	1.6	<5	<1	7	81	75	<0.1	7	294	<10	<10	<50	<50	310	120	430	<10	<50	210
SS02	SS02		15/03/2017	Normal	3.4	<0.2	<0.2	<0.2	3.4	<0.5	1	5.1 - 9	8.7	24.6	-	-	8.1	1.6	<5	<1	2	34	21	<0.1	3	80	<10	<10	<50	<50	<100	<100	<50	<10	<50	<100
SS03	SS03		15/03/2017	Normal	2.3	<0.2	<0.2	<0.2	2.3	1.4	1	5 - 8.2	8	31.8	-	-	7.3	1.6	<5	<1	5	48	266	<0.1	5	154	<10	<10	<50	<50	160	<100	160	<10	<50	110

Appendix B
Table A
Sediment analytical results

	NEPM 1999			BTEX & MAH							PAH																										
	C29 - C36 Fraction	C10 - C36 (Sum of Total)	C10 - C36 (Sum of Total) normalised for TOC	Benzene	Toluene	Ethylbenzene	Xylene (o)	Xylene (m & p)	Xylene Total	BTEX (Sum of Total) - Lab Calc	Polycylic aromatic hydrocarbons	Pyrene	Acenaphthene	Acenaphthylene	Anthracene	Benz(a)anthracene	Benzo(a)pyrene	Benzo[b+j]fluoranthene	Benzo(k)fluoranthene	Benzo(g,h,i)perylene	Chrysene	Dibenz(a,h)anthracene	Fluoranthene	Fluorene	Indeno(1,2,3-c,d)pyrene	Naphthalene	Phenanthrene	PAHs (Sum of total) - Lab calc	PAHs (Sum of total) - Lab calc Noramlised for TOC	Benzo(a)pyrene TEQ (zero) - Lab Calc	Benzo(a)pyrene TEQ (half LOR) - Lab Calc	Benzo(a)pyrene TEQ (LOR) - Lab Calc	Perfluorodecanesulfonic acid (PFDS)	PFHxS and PFOS (Sum of Total) - Lab Calc	4:2 Fluorotelomer sulfonic acid
	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg
EQL	100	50		0.2	0.5	0.5	0.5	0.5	0.5	0.2	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5		0.5	0.5	0.5	0.0002	0.0002	0.0005
ANZECC 2016 ISQG -High			550																										50						
ANZECC 2016 ISQG -Low			280																										10						
Field_ID	**Location_Code**	**Sample_Depth_Range**	**Sampled_Date_Time**	**Sample_Type**																																	
DUP1	SS01		15/03/2017	Field_D	150	330	275	<0.2	<0.5	<0.5	<0.5	<0.5	<0.5	<0.2	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	-	-	<0.5	0.6	1.2	<0.0002	0.0027	<0.0005
SPLIT 1	SS01		15/03/2017	Interlab_D	<50	55	34	<0.1	<0.1	<0.1	<0.1	<0.2	<0.3	-	-	<0.5	<0.5	<0.5	<0.5	0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	0.5	0.31	<0.5	0.6	1.2	<0.005	-	<0.005
SS01	SS01		15/03/2017	Normal	170	380	224	<0.2	<0.5	<0.5	<0.5	<0.5	<0.5	<0.2	1.6	0.8	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	0.8	<0.5	<0.5	<0.5	<0.5	-	-	<0.5	0.6	1.2	<0.0002	0.0022	<0.0005
SS02	SS02		15/03/2017	Normal	<100	<50	-	<0.2	<0.5	<0.5	<0.5	<0.5	<0.5	<0.2	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	-	-	<0.5	0.6	1.2	<0.0002	0.0003	<0.0005
SS03	SS03		15/03/2017	Normal	100	210	150	<0.2	<0.5	<0.5	<0.5	<0.5	<0.5	<0.2	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	-	-	<0.5	0.6	1.2	<0.0002	0.001	<0.0005

Appendix B
Table A
Sediment analytical results

							PFAS																							
							10:2 Fluorotelomer sulfonic acid	N-Ethyl perfluorooctane sulfonamidoacetic acid	Perfluoroheptane sulfonic acid	N-Methyl perfluorooctane sulfonamidoacetic acid	Perfluorobutane sulfonic acid	Perfluorohexane sulfonic acid (PFHxS)	Perfluoropentanoic acid	8:2 Fluorotelomer sulfonic acid	N-Ethyl perfluorooctane sulfonamide	N-Ethyl perfluorooctane sulfonamidoethanol	N-Methyl perfluorooctane sulfonamide	N-Methyl perfluorooctane sulfonamidoethanol	6:2 Fluorotelomer Sulfonate (6:2 FTS)	Perfluorooctanoic acid (PFOA)	Perfluoropentane sulfonic acid	Perfluorobutanoic acid	Perfluorodecanoic acid	Perfluorododecanoic acid	Perfluoroheptanoic acid	Perfluorohexanoic acid (PFHxA)	Perfluorononanoic acid	Perfluorooctane sulfonic acid (PFOS)	Perfluorooctane sulfonamide (FOSA)	Perfluorotetradecanoic acid	Perfluorotridecanoic acid	Perfluoroundecanoic acid
							mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg
EQL							0.0005	0.0002	0.0002	0.0002	0.0002	0.0002	0.0002	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0002	0.0002	0.001	0.0002	0.0002	0.0002	0.0002	0.0002	0.0002	0.0002	0.0005	0.0002	0.0002
ANZECC 2016 ISQG -High																																
ANZECC 2016 ISQG -Low																																
Field_ID	**Location_Code**	**Sample_Depth_Range**	**Sampled_Date_Time**	**Sample_Type**																												
DUP1	SS01		15/03/2017	Field_D	<0.0005	<0.0002	<0.0002	<0.0002	<0.0002	0.0003	<0.0002	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	0.0003	<0.0002	<0.001	<0.0002	0.0012	<0.0002	<0.0002	<0.0002	0.0024	<0.0002	<0.0005	<0.0002	<0.0002
SPLIT 1	SS01		15/03/2017	Interlab_D	<0.005	<0.01	<0.005	<0.01	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.01	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
SS01	SS01		15/03/2017	Normal	<0.0005	<0.0002	<0.0002	<0.0002	<0.0002	0.0004	<0.0002	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	0.0003	<0.0002	<0.001	0.0005	0.0012	<0.0002	<0.0002	<0.0002	0.0018	<0.0002	<0.0005	<0.0002	<0.0002
SS02	SS02		15/03/2017	Normal	<0.0005	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0002	<0.001	<0.0002	0.0004	<0.0002	<0.0002	<0.0002	0.0003	<0.0002	<0.0005	<0.0002	<0.0002
SS03	SS03		15/03/2017	Normal	<0.0005	<0.0002	0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0002	<0.0002	<0.001	0.0002	0.0017	<0.0002	<0.0002	<0.0002	0.001	<0.0002	<0.0005	<0.0002	<0.0002

Appendix B
Table A
Sediment analytical results

					Major Ions							
					PFAS (Sum of Total)	PFAS (Sum of Total)(WA DER List)	Calcium	Chloride	Magnesium	Potassium	Sodium	Sulphate
					mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg
EQL					0.0002	0.0002	10	10	10	10	10	10
ANZECC 2016 ISQG -High												
ANZECC 2016 ISQG -Low												
Field_ID	**Location_Code**	**Sample_Depth_Range**	**Sampled_Date_Time**	**Sample_Type**								
DUP1	SS01		15/03/2017	Field_D	0.0042	0.003	100	20	10	10	20	60
SPLIT 1	SS01		15/03/2017	Interlab_D	-	-	-	-	-	-	-	-
SS01	SS01		15/03/2017	Normal	0.0042	0.0025	100	20	10	10	20	70
SS02	SS02		15/03/2017	Normal	0.0007	0.0003	40	10	<10	10	10	20
SS03	SS03		15/03/2017	Normal	0.0031	0.001	120	30	10	20	20	50

Appendix B
Table B
ASLP analytical results

				PFAS																																	
				Perfluorodecanesulfonic acid (PFDS)	PFHxS and PFOS (Sum of Total) - Lab Calc	4:2 Fluorotelomer sulfonic acid	10:2 Fluorotelomer sulfonic acid	N-Ethyl perfluorooctane sulfonamidoacetic acid	Perfluoroheptane sulfonic acid	N-Methyl perfluorooctane sulfonamidoacetic acid	Perfluorobutane sulfonic acid	Perfluorohexane sulfonic acid (PFHxS)	Perfluoropentanoic acid	8:2 Fluorotelomer sulfonic acid	N-Ethyl perfluorooctane sulfonamide	N-Ethyl perfluorooctane sulfonamidoethanol	N-Methyl perfluorooctane sulfonamide	N-Methyl perfluorooctane sulfonamidoethanol	6:2 Fluorotelomer Sulfonate (6:2 FTS)	Perfluorooctanoic acid (PFOA)	Perfluoropentane sulfonic acid	Perfluorobutanoic acid	Perfluorodecanoic acid	Perfluorododecanoic acid	Perfluoroheptanoic acid	Perfluorohexanoic acid (PFHxA)	Perfluorononanoic acid	Perfluorooctane sulfonic acid (PFOS)	Perfluorooctane sulfonamide (FOSA)	Perfluorotetradecanoic acid	Perfluorotridecanoic acid	Perfluoroundecanoic acid	PFAS (Sum of Total)	PFAS (Sum of Total)(WA DER List)
				µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L
EQL				0.02	0.01	0.05	0.05	0.02	0.02	0.02	0.02	0.02	0.02	0.05	0.05	0.05	0.05	0.05	0.05	0.01	0.02	0.1	0.02	0.02	0.02	0.02	0.02	0.01	0.02	0.05	0.02	0.02	0.01	0.01
Site_ID	Field_ID	Location_Code	Sampled_Date_Time																																		
Alexandria FRNSW	DUP1	SS01	15/03/2017	<0.02	0.02	<0.05	<0.05	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.01	<0.02	<0.1	<0.02	<0.02	<0.02	<0.02	<0.02	0.02	<0.02	<0.05	<0.02	<0.02	0.02	0.02
Alexandria FRNSW	SS01	SS01	15/03/2017	<0.02	0.03	<0.05	<0.05	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.01	<0.02	<0.1	<0.02	<0.02	<0.02	<0.02	<0.02	0.03	<0.02	<0.05	<0.02	<0.02	0.03	0.03
Alexandria FRNSW	SS02	SS02	15/03/2017	<0.02	0.01	<0.05	<0.05	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.01	<0.02	<0.1	<0.02	<0.02	<0.02	<0.02	<0.02	0.01	<0.02	<0.05	<0.02	<0.02	0.01	0.01
Alexandria FRNSW	SS03	SS03	15/03/2017	<0.02	0.01	<0.05	<0.05	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.01	<0.02	<0.1	<0.02	<0.02	<0.02	<0.02	<0.02	0.01	<0.02	<0.05	<0.02	<0.02	0.01	0.01

Env Stds Comments
#1: Dilution factor of 10 applied

Appendix B
Table C
Surface water analytical results

	TOC	Inorganics		Metals															TRH - NEPM 2013							TRH - NEPM 1999					BTEX & MAH				
	Total Organic Carbon	pH (Lab)	Total Dissolved Solids (Filtered)	Arsenic	Arsenic (Filtered)	Cadmium	Cadmium (Filtered)	Chromium (III+VI)	Chromium (III+VI) (Filtered)	Copper	Copper (Filtered)	Lead	Lead (Filtered)	Mercury	Mercury (Filtered)	Nickel	Nickel (Filtered)	Zinc	Zinc (Filtered)	C6-C10 minus BTEX (F1)	C6 - C10 Fraction	>C10-C16 minus Naphthalene (F2)	>C10 - C16 Fraction	>C16 - C34 Fraction (F3)	>C34 - C40 Fraction (F4)	>C10 - C40 (Sum of Total)	C6 - C 9 Fraction	C10 - C14 Fraction	C15 - C28 Fraction	C29 - C36 Fraction	C10 - C36 (Sum of Total)	Benzene	Toluene	Ethylbenzene	Xylene (o)	Xylene (m & p)
	mg/L	pH Units	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L
EQL	1	0.01	10	0.001	0.001	0.0001	0.0001	0.001	0.001	0.001	0.001	0.001	0.001	0.0001	0.0001	0.001	0.001	0.005	0.005	20	20	100	100	100	100	100	20	50	100	50	50	1	2	2	2	2
FSANZ (2017) - Recreational water quality guideline																																				
NEPM 2013 Table 1C GILs, Marine Waters						0.0007[#1]	0.0007[#1]			0.0013[#2]	0.0013[#2]	0.0044[#2]	0.0044[#2]	0.0001[#3]	0.0001[#3]	0.007[#2]	0.007[#2]	0.015[#4]	0.015[#4]												500[#5]				
NHMRC Recreational Guidelines 2008				*0.1*	*0.1*	*0.02*	*0.02*			*20*	*20*	*0.1*	*0.1*	*0.01*	*0.01*	*0.2*	*0.2*														*10*	*8000*	*3000*		
Draft ANZECC Guideline - Ecological Freshwater and Marine (99% species protection)																																				
Field_ID	Location_Code	Sampled_Date_Time	Sample_Type																																	
DUP1	SW01	15/03/2017	Field_D	10	8.14	240	0.003	0.002	<0.0001	<0.0001	0.005	0.001	0.03	0.007	0.027	0.001	<0.0001	<0.0001	0.003	0.001	0.115	0.022	<20	<20	<100	<100	<100	<100	<100	<20	<50	<100	<50	<50	<1	<2	<2	<2	<2
SP_450_01	SP_450_01	15/03/2017	Normal	2	7.15	59	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
SPLIT 1	SW01	15/03/2017	Interlab_D	7.5	7.3	-	0.003	-	<0.0002	-	0.004	-	0.027	-	0.023	-	<0.0001	-	0.002	-	0.1	-	<20	<20	<50	<50	<100	<100	-	<20	<50	<100	<100	<100	<1	<1	<1	<1	<2
SW01	SW01	15/03/2017	Normal	10	8.14	231	0.004	0.003	<0.0001	<0.0001	0.005	0.002	0.032	0.006	0.029	<0.001	<0.0001	<0.0001	0.003	0.001	0.114	0.016	<20	<20	<100	<100	<100	<100	<100	<20	<50	<100	<50	<50	<1	<2	<2	<2	<2
SW02	SW02	15/03/2017	Normal	11	7.99	212	0.004	0.002	<0.0001	<0.0001	0.005	0.002	0.034	0.007	0.026	0.001	0.0001	<0.0001	0.003	0.001	0.11	0.018	<20	<20	<100	<100	<100	<100	<100	<20	<50	<100	<50	<50	<1	<2	<2	<2	<2
SW03	SW03	15/03/2017	Normal	10	7.74	214	0.003	0.003	<0.0001	0.0001	0.004	0.002	0.029	0.008	0.024	0.001	<0.0001	<0.0001	0.004	0.001	0.121	0.022	<20	<20	<100	<100	<100	<100	<100	<20	<50	<100	<50	<50	<1	<2	<2	<2	<2
SW04	SW04	15/03/2017	Normal	10	8.06	217	0.003	0.002	<0.0001	0.0001	0.005	0.002	0.021	0.006	0.02	0.001	<0.0001	<0.0001	0.002	0.001	0.094	0.014	<20	<20	<100	<100	<100	<100	<100	<20	<50	<100	<50	<50	<1	<2	<2	<2	<2

Env Stds Comments
#1:Values calculated using hardness of 30 mg/L CaCO3. Chemical for which possible bioaccumulation and secondary poisoning effects should be considered.
#2:Values calculated using hardness of 30 mg/L CaCO3. Refer ANZECC & ARMCANZ (2000) for site specific hardness guidance
#3:Chemical for which possible bioaccumulation and secondary poisoning effects should be considered, refer to ANZECC & ARMCANZ (2000) for further guidance.
#4:Values calculated using hardness of 30 mg/L CaCO3. Figure may not protect key species from chronic toxicity. Refer ANZECC & ARMCANZ (2000) for guidance
#5:Figure may not protect key species from chronic toxicity, refer to ANZECC & ARMCANZ (2000) for further guidance.

Data Comments
#1 Quantification of linear and branched isomers has been conducted as a single total response using the relative response factor for the corresponding linear/branched standard.

Appendix B
Table C
Surface water analytical results

			PAH																			PFAS																									
			Xylene Total	BTEX (Sum of Total) - Lab Calc	Polycylic aromatic hydrocarbons	Pyrene	Acenaphthene	Acenaphthylene	Anthracene	Benz(a)anthracene	Benzo(a)pyrene	Benzo[b+j]fluoranthene	Benzo(k)fluoranthene	Benzo(g,h,i)perylene	Chrysene	Dibenz(a,h)anthracene	Fluoranthene	Fluorene	Indeno(1,2,3-c,d)pyrene	Naphthalene	Phenanthrene	PAHs (Sum of total) - Lab calc	Benzo(a)pyrene TEQ (zero) - Lab Calc	Perfluorodecanesulfonic acid (PFDS)	PFHxS and PFOS (Sum of Total) - Lab Calc	4:2 Fluorotelomer sulfonic acid	10:2 Fluorotelomer sulfonic acid	N-Ethyl perfluorooctane sulfonamidoacetic acid	Perfluoroheptane sulfonic acid	N-Methyl perfluorooctane sulfonamidoacetic acid	Perfluorobutane sulfonic acid	Perfluorohexane sulfonic acid (PFHxS)	Perfluoropentanoic acid	8:2 Fluorotelomer sulfonic acid	N-Ethyl perfluorooctane sulfonamide	N-Ethyl perfluorooctane sulfonamidoethanol	N-Methyl perfluorooctane sulfonamide	N-Methyl perfluorooctane sulfonamidoethanol	6:2 Fluorotelomer Sulfonate (6:2 FTS)	Perfluorooctanoic acid (PFOA)	Perfluoropentane sulfonic acid	Perfluorobutanoic acid	Perfluorodecanoic acid	Perfluorododecanoic acid
			µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L
EQL			2	1	0.5	1	1	1	1	1	0.5	1	1	1	1	1	1	1	1	1	1	1	0.5	0.02	0.01	0.05	0.05	0.02	0.02	0.02	0.02	0.02	0.02	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.01	0.02	0.1	0.02	0.02
FSANZ (2017) - Recreational water quality guideline																									0.7																		5.6					
NEPM 2013 Table 1C GILs, Marine Waters																				50[#5]																											
NHMRC Recreational Guidelines 2008			*6000*																			*0.1*																									
Draft ANZECC Guideline - Ecological Freshwater and Marine (99% species protection)																																									19					
Field_ID	Location_Code	Sampled_Date_Time	Sample_Type																																												
DUP1	SW01	15/03/2017	Field_D	<2	<1	<0.5	<1	<1	<1	<1	<1	<0.5	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	-	<0.5	<0.02	<0.01	<0.05	<0.05	<0.02	<0.02	<0.02	<0.02	<0.02	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.01	<0.02	<0.1	<0.02	<0.02
SP_450_01	SP_450_01	15/03/2017	Normal	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<0.02	0.89	<0.05	<0.05	<0.02	<0.02	<0.02	<0.02	0.19	0.02	0.05	<0.05	<0.05	<0.05	<0.05	0.5	0.02	<0.02	<0.1	<0.02	<0.02
SPLIT 1	SW01	15/03/2017	Interlab_D	<3	-	-	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	-	<0.01	-	<0.01	0.02	<0.05	<0.01	<0.05	<0.01	0.02[#1]	0.02	0.01	<0.05	<0.05	<0.05	<0.05	<0.05	0.04[#1]	<0.01	<0.05	0.02	<0.01
SW01	SW01	15/03/2017	Normal	<2	<1	<0.5	<1	<1	<1	<1	<1	<0.5	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	-	<0.5	<0.02	<0.01	<0.05	<0.05	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.01	<0.02	<0.1	<0.02	<0.02
SW02	SW02	15/03/2017	Normal	<2	<1	<0.5	<1	<1	<1	<1	<1	<0.5	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	-	<0.5	<0.02	0.1	<0.05	<0.05	<0.02	<0.02	<0.02	<0.02	0.03	<0.02	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	0.02	<0.02	<0.1	<0.02	<0.02
SW03	SW03	15/03/2017	Normal	<2	<1	<0.5	<1	<1	<1	<1	<1	<0.5	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	-	<0.5	<0.02	0.19	<0.05	<0.05	<0.02	<0.02	<0.02	<0.02	0.05	<0.02	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	0.04	<0.02	<0.1	<0.02	<0.02
SW04	SW04	15/03/2017	Normal	<2	<1	<0.5	<1	<1	<1	<1	<1	<0.5	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	-	<0.5	<0.02	0.01	<0.05	<0.05	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	0.03	<0.02	<0.1	<0.02	<0.02

Env Stds Comments
#1:Values calculated using hardness of 30 mg/L CaCO3. Chemical for which possible bioaccumu
#2:Values calculated using hardness of 30 mg/L CaCO3. Refer ANZECC & ARMCANZ (2000) for si
#3:Chemical for which possible bioaccumulation and secondary poisoning effects should be cor
#4:Values calculated using hardness of 30 mg/L CaCO3. Figure may not protect key species from
#5:Figure may not protect key species from chronic toxicity, refer to ANZECC & ARMCANZ (200

Data Comments
#1 Quantification of linear and branched isomers has been conducted as a single total respons

Appendix B
Table C
Surface water analytical results

												Alkalinity				Major Ions							
				Perfluoroheptanoic acid	Perfluorohexanoic acid (PFHxA)	Perfluorononanoic acid	Perfluorooctane sulfonic acid (PFOS)	Perfluorooctane sulfonamide (FOSA)	Perfluorotetradecanoic acid	Perfluorotridecanoic acid	Perfluoroundecanoic acid	PFAS (Sum of Total)	PFAS (Sum of Total)(WA DER List)	Alkalinity (Carbonate as CaCO3)	Alkalinity (Hydroxide as CaCO3)	Alkalinity (total as CaCO3)	Bicarbonate Alkalinity as CaCO3	Sulfate as SO4 - Turbidimetric (Filtered)	Calcium (Filtered)	Chloride	Magnesium (Filtered)	Anions Total	Potassium (Filtered)	Sodium (Filtered)	Cations Total
				µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	meq/L	mg/L	mg/L	meq/L
EQL				0.02	0.02	0.02	0.01	0.02	0.05	0.02	0.02	0.01	0.01	1	1	1	1	1	1	1	1	0.01	1	1	0.01
FSANZ (2017) - Recreational water quality guideline																									
NEPM 2013 Table 1C GILs, Marine Waters																									
NHMRC Recreational Guidelines 2008																									
Draft ANZECC Guideline - Ecological Freshwater and Marine (99% species protection)							0.00023																		
Field_ID	Location_Code	Sampled_Date_Time	Sample_Type																						
DUP1	SW01	15/03/2017	Field_D	<0.02	<0.02	<0.02	<0.01	<0.02	<0.05	<0.02	<0.02	<0.01	<0.01	<1	<1	84	84	34	28	22	4	3.01	11	20	2.88
SP_450_01	SP_450_01	15/03/2017	Normal	<0.02	0.05	<0.02	0.7	<0.02	<0.05	<0.02	<0.02	1.53	1.53	<1	<1	17	17	4	6	12	2	0.76	<1	7	0.77
SPLIT 1	SW01	15/03/2017	Interlab_D	0.01	0.02	<0.01	0.03[#1]	<0.05	<0.01	<0.01	<0.01	-	-	-	-	-	-	-	-	-	-	-	-	-	-
SW01	SW01	15/03/2017	Normal	<0.02	<0.02	<0.02	<0.01	<0.02	<0.05	<0.02	<0.02	<0.01	<0.01	<1	<1	86	86	30	26	22	4	2.96	12	21	2.85
SW02	SW02	15/03/2017	Normal	<0.02	<0.02	<0.02	0.07	<0.02	<0.05	<0.02	<0.02	0.12	0.12	<1	<1	102	102	30	28	22	4	3.28	10	20	2.85
SW03	SW03	15/03/2017	Normal	<0.02	<0.02	<0.02	0.14	<0.02	<0.05	<0.02	<0.02	0.23	0.23	<1	<1	68	68	29	24	21	4	2.55	8	17	2.47
SW04	SW04	15/03/2017	Normal	<0.02	<0.02	<0.02	0.01	<0.02	<0.05	<0.02	<0.02	0.04	0.04	<1	<1	75	75	31	25	21	4	2.74	11	20	2.73

Env Stds Comments
#1:Values calculated using hardness of 30 mg/L CaCO3. Chemical for which possible bioaccumu
#2:Values calculated using hardness of 30 mg/L CaCO3. Refer ANZECC & ARMCANZ (2000) for si
#3:Chemical for which possible bioaccumulation and secondary poisoning effects should be cor
#4:Values calculated using hardness of 30 mg/L CaCO3. Figure may not protect key species from
#5:Figure may not protect key species from chronic toxicity, refer to ANZECC & ARMCANZ (200

Data Comments
#1 Quantification of linear and branched isomers has been conducted as a single total respons

Appendix C – Field Sampling Sheets

Surface ~~GROUND~~WATER PURGING AND SAMPLING FIELD SHEET

GHD

PROJECT DETAILS	~~Borehole ID~~
Project Number: 21-25583-03	
Project Name: Alexandria Training Centre	Sample ID: SW01
Client: Fire and Rescue NSW	Date: 15.3.17
Site: 189 Wyndham St, Alexandria NSW	Sampler: ~~T. Nham~~ D.GAG
Well Condition (i.e road box, locked etc):	Purge Method:
Depth to Water Table Pre-purge (from TOC):	Sample Method:
Depth of PSH (from TOC):	Casing Type:
Depth to Bottom of Casing (BOC) from TOC:	Well Diameter:
Casing Stickup:	Calculated Bore Volume(L):
Depth to Water Table Post - purge (from TOC):	QA Collected: Dupe & Split

FIELD PARAMETERS (RECORDED USING *YSI*)

Time	Volume (L)	Depth to Water from TOC(m)	D.O (ppm ~~mg/L~~)	E.C (us/cm)	pH	Eh (mv)	Temp (°C)	Comments
12:07	—	—	7.09	279	7.95	82.0	22.2	Slight turbidity, Organic odour, flow ~ 1.5 ms⁻¹, 20mm depth.
			(Stabilised after ~10 mins)					
Post Sample Parameters								

Number of Bottles:

Comments:

Well Volume Calculation (50mm diameter) 3.8xH (H=height of water column)

Surface ~~GROUND~~WATER PURGING AND SAMPLING FIELD SHEET

GHD

PROJECT DETAILS	~~Borehole ID~~
Project Number: 21-25583-03	
Project Name: Alexandria Training Centre	Sample ID: SW02
Client: Fire and Rescue NSW	Date: 15.3.17
Site: 189 Wyndham St, Alexandria NSW	Sampler: ~~T. Nham~~ D. GACT
Well Condition (i.e road box, locked etc):	Purge Method:
Depth to Water Table Pre-purge (from TOC):	Sample Method:
Depth of PSH (from TOC):	Casing Type:
Depth to Bottom of Casing (BOC) from TOC:	Well Diameter:
Casing Stickup:	Calculated Bore Volume(L):
Depth to Water Table Post - purge (from TOC):	QA Collected: No

FIELD PARAMETERS (RECORDED USING *YSI*)

Time	Volume (L)	Depth to Water from TOC(m)	D.O (ppm ~~mg/L~~)	E.C (us/cm)	pH	Eh (mv)	Temp (°C)	Comments
11:19	-	-	7.16	272.1	7.66	102.6	22.2	Slight turbidity, flow ~1.5 ms⁻¹ 20mm depth, no odours.
			(Stabilised reading after ~10 mins)					
Post Sample Parameters								

Number of Bottles:

Comments:

Well Volume Calculation (50mm diameter) 3.8xH (H=height of water column)

~~GROUND~~WATER PURGING AND SAMPLING FIELD SHEET

PROJECT DETAILS	~~Borehole ID~~
Project Number: 21-25583-03	
Project Name: Alexandria Training Centre	Sample ID: SW03
Client: Fire and Rescue NSW	Date:
Site: 189 Wyndham St, Alexandria NSW	Sampler: ~~T. Nham~~ D. GACT
Well Condition (i.e road box, locked etc):	Purge Method:
Depth to Water Table Pre-purge (from TOC):	Sample Method:
Depth of PSH (from TOC):	Casing Type:
Depth to Bottom of Casing (BOC) from TOC:	Well Diameter:
Casing Stickup:	Calculated Bore Volume(L):
Depth to Water Table Post - purge (from TOC):	QA Collected: No

FIELD PARAMETERS (RECORDED USING *YSI*)

Time	Volume (L)	Depth to Water from TOC(m)	D.O (ppm ~~mg/L~~)	E.C (us/cm)	pH	Eh (mv)	Temp (°C)	Comments
10:59	-	-	7.91	265.4	8.06	95.2	22.3	Slight turbidity, flow ~1.0 ms^{-1}, <20mm depth, no odour.
			(stabilised after ~10 mins)					
Post Sample Parameters								

Number of Bottles:

Comments:

Well Volume Calculation (50mm diameter) 3.8xH (H=height of water column)

~~GROUND~~WATER PURGING AND SAMPLING FIELD SHEET

PROJECT DETAILS	~~Borehole ID~~
Project Number: 21-25583-03	
Project Name: Alexandria Training Centre	Sample ID: SW04
Client: Fire and Rescue NSW	Date:
Site: 189 Wyndham St, Alexandria NSW	Sampler: ~~T. Nham~~ D. CALT
Well Condition (i.e road box, locked etc):	Purge Method:
Depth to Water Table Pre-purge (from TOC):	Sample Method:
Depth of PSH (from TOC):	Casing Type:
Depth to Bottom of Casing (BOC) from TOC:	Well Diameter:
Casing Stickup:	Calculated Bore Volume(L):
Depth to Water Table Post - purge (from TOC):	QA Collected: No

FIELD PARAMETERS (RECORDED USING *YSI*)

Time	Volume (L)	Depth to Water from TOC(m)	D.O (ppm ~~mg/L~~)	E.C (us/cm)	pH	Eh (mv)	Temp (°C)	Comments
11:47	–	–	7.06	269.6	7.88	88	22.2	slight turbidity, v. slight sewage odour, 20mm depth, flow ~1.5ms⁻¹
			(Stabilised ready after ~10mins)					
Post Sample Parameters								

Number of Bottles:

Comments:

Well Volume Calculation (50mm diameter) 3.8xH (H=height of water column)

SURFACE WATER SAMPLING RECORD

PROJECT NO.	21255303	**DATE:**	15.3.17
PROJECT NAME:	FRNSW ALEXANDRIA	**TIME:**	11:55
CLIENT:		**SAMPLING OFFICERS:**	D. CAH
SITE:			
COORDINATES/GPS *(If Applicable)*	–		
SAMPLING METHOD *(ie grab, bucket)*	Grab		
DETAILED SAMPLE LOCATION DESCRIPTION	stormwater outlet – 450mm pipe inside stormwater culvert – Approx 12m Nth from upstream entry on East		

ENVIRONMENTAL OBSERVATIONS

WEATHER	light rain.
VEGETATION	NIL
SLOPE	–
EROSION	–
OTHER	collected stormwater flow from above site (Alexandria FRNSW) – 2x stand pipes + Fire truck running water into site

FIELD MEASUREMENTS

TEMPERATURE (°C)	
CONDUCTIVITY (uS/cm)	
pH	N/A
DO (ppm)	
REDOX (mV)	

HYDROLOGICAL DATA

FLOW MEASUREMENT (or stream height if rating table available)	Flow was ~ 0.6 ms^{-1} w/ 3.63 Litres/min.
CROSS SECTION WIDTH (m)	– 450mm s/water pipe.
DEPTH (m)	–
OTHER observations –	slight chemical odour, very clear, no streams

SAMPLE NO.	NO. OF CONTAINERS	PRESERVATIVE	DUPLICATE	COMMENTS
SP_450_01	2	NIL	NIL	PFAS + pH, TDS, TOC sampled.

FIELD SUPERVISOR DC **CHECKED** (SIGN & DATE) 15.3.17

Appendix D – NATA accredited laboratory reports and chain of custody documentation

ALS Environmental

CERTIFICATE OF ANALYSIS

Work Order	: **ES1706190**	Page	: 1 of 22
Client	: **GHD PTY LTD**	Laboratory	: Environmental Division Sydney
Contact	: MR BEN ANDERSON	Contact	: Vanessa Mattes
Address	: LEVEL 15, 133 CASTLEREAGH STREET SYDNEY NSW, AUSTRALIA 2000	Address	: 277-289 Woodpark Road Smithfield NSW Australia 2164
Telephone	: +61 08 6222 8222	Telephone	: +61-2-8784 8555
Project	: 21-25583-03 ALEXANDRIA	Date Samples Received	: 15-Mar-2017 16:35
Order number	: ----	Date Analysis Commenced	: 16-Mar-2017
C-O-C number	: ----	Issue Date	: 23-Mar-2017 10:22
Sampler	: DYLAN GALT		
Site	: ----		
Quote number	: EN/005/15		
No. of samples received	: 15		
No. of samples analysed	: 15		

Accreditation No. 825
Accredited for compliance with
ISO/IEC 17025 - Testing

This report supersedes any previous report(s) with this reference. Results apply to the sample(s) as submitted. This document shall not be reproduced, except in full.

This Certificate of Analysis contains the following information:

- General Comments
- Analytical Results
- Surrogate Control Limits

Additional information pertinent to this report will be found in the following separate attachments: Quality Control Report, QA/QC Compliance Assessment to assist with Quality Review and Sample Receipt Notification.

Signatories

This document has been electronically signed by the authorized signatories below. Electronic signing is carried out in compliance with procedures specified in 21 CFR Part 11.

Signatories	*Position*	*Accreditation Category*
Alex Rossi	Organic Chemist	Sydney Organics, Smithfield, NSW
Ankit Joshi	Inorganic Chemist	Sydney Inorganics, Smithfield, NSW
Dian Dao		Sydney Inorganics, Smithfield, NSW
Edwandy Fadjar	Organic Coordinator	Sydney Inorganics, Smithfield, NSW
Edwandy Fadjar	Organic Coordinator	Sydney Organics, Smithfield, NSW
Lana Nguyen	Senior LCMS Chemist	Sydney Organics, Smithfield, NSW
Raymond Commodore	Instrument Chemist	Sydney Inorganics, Smithfield, NSW
Sanjeshni Jyoti	Senior Chemist Volatiles	Sydney Organics, Smithfield, NSW
Wisam Marassa	Inorganics Coordinator	Sydney Inorganics, Smithfield, NSW

General Comments

The analytical procedures used by the Environmental Division have been developed from established internationally recognized procedures such as those published by the USEPA, APHA, AS and NEPM. In house developed procedures are employed in the absence of documented standards or by client request.

Where moisture determination has been performed, results are reported on a dry weight basis.

Where a reported less than (<) result is higher than the LOR, this may be due to primary sample extract/digestate dilution and/or insufficient sample for analysis.

Where the LOR of a reported result differs from standard LOR, this may be due to high moisture content, insufficient sample (reduced weight employed) or matrix interference.

When no sampling time is provided, the sampling time will default 00:00 on the date of sampling. If no sampling date is provided, the sampling date will be assumed by the laboratory and displayed in brackets without a time component.

Where a result is required to meet compliance limits the associated uncertainty must be considered. Refer to the ALS Contact for details.

Key : CAS Number = CAS registry number from database maintained by Chemical Abstracts Services. The Chemical Abstracts Service is a division of the American Chemical Society.
LOR = Limit of reporting
^ = This result is computed from individual analyte detections at or above the level of reporting
ø = ALS is not NATA accredited for these tests.
~ = Indicates an estimated value.

- EG035: Poor matrix spike recovery was obtained for Mercury on sample ES1706089 # 1 due to high matrix interference. Confirmed by re-analysis.
- EG020: It is recognised that total concentration is less than dissolved for some metal analytes. However, the difference is within experimental variation of the methods.
- EP080: Sample TRIP SPIKE contains volatile compounds spiked into the sample containers prior to dispatch from the laboratory. BTEX compounds spiked at 20 ug/L.
- Benzo(a)pyrene Toxicity Equivalent Quotient (TEQ) is the sum total of the concentration of the eight carcinogenic PAHs multiplied by their Toxicity Equivalence Factor (TEF) relative to Benzo(a)pyrene. TEF values are provided in brackets as follows: Benz(a)anthracene (0.1), Chrysene (0.01), Benzo(b+j) & Benzo(k)fluoranthene (0.1), Benzo(a)pyrene (1.0), Indeno(1.2.3.cd)pyrene (0.1), Dibenz(a.h)anthracene (1.0), Benzo(g.h.i)perylene (0.01). Less than LOR results for 'TEQ Zero' are treated as zero, for 'TEQ 1/2LOR' are treated as half the reported LOR, and for 'TEQ LOR' are treated as being equal to the reported LOR. Note: TEQ 1/2LOR and TEQ LOR will calculate as 0.6mg/Kg and 1.2mg/Kg respectively for samples with non-detects for all of the eight TEQ PAHs.
- Benzo(a)pyrene Toxicity Equivalent Quotient (TEQ) is the sum total of the concentration of the eight carcinogenic PAHs multiplied by their Toxicity Equivalence Factor (TEF) relative to Benzo(a)pyrene. TEF values are provided in brackets as follows: Benz(a)anthracene (0.1), Chrysene (0.01), Benzo(b+j) & Benzo(k)fluoranthene (0.1), Benzo(a)pyrene (1.0), Indeno(1.2.3.cd)pyrene (0.1), Dibenz(a.h)anthracene (1.0), Benzo(g.h.i)perylene (0.01). Less than LOR results for 'TEQ Zero' are treated as zero.
- ED007 and ED008: When Exchangeable Al is reported from these methods, it should be noted that Rayment & Lyons (2011) suggests Exchange Acidity by 1M KCl - Method 15G1 (ED005) is a more suitable method for the determination of exchange acidity (H+ + Al3+).

Analytical Results

Sub-Matrix: **DI WATER LEACHATE** (Matrix: **WATER**)

Compound	CAS Number	LOR	Unit	Client sample ID	SS01 DI LEACH	SS02 DI LEACH	SS03 DI LEACH	DUP1 DI LEACH	----
				Client sampling date / time	15-Mar-2017 00:00	15-Mar-2017 00:00	15-Mar-2017 00:00	15-Mar-2017 00:00	----
					ES1706190-012	ES1706190-013	ES1706190-014	ES1706190-015	--------
					Result	Result	Result	Result	----
EP231A: Perfluoroalkyl Sulfonic Acids									
Perfluorobutane sulfonic acid (PFBS)	375-73-5	0.02	µg/L		<0.02	<0.02	<0.02	<0.02	----
Perfluoropentane sulfonic acid (PFPeS)	2706-91-4	0.02	µg/L		<0.02	<0.02	<0.02	<0.02	----
Perfluorohexane sulfonic acid (PFHxS)	355-46-4	0.02	µg/L		<0.02	<0.02	<0.02	<0.02	----
Perfluoroheptane sulfonic acid (PFHpS)	375-92-8	0.02	µg/L		<0.02	<0.02	<0.02	<0.02	----
Perfluorooctane sulfonic acid (PFOS)	1763-23-1	0.01	µg/L		**0.04**	**0.01**	**0.02**	**0.03**	----
Perfluorodecane sulfonic acid (PFDS)	335-77-3	0.02	µg/L		<0.02	<0.02	<0.02	<0.02	----
EP231B: Perfluoroalkyl Carboxylic Acids									
Perfluorobutanoic acid (PFBA)	375-22-4	0.1	µg/L		<0.1	<0.1	<0.1	<0.1	----
Perfluoropentanoic acid (PFPeA)	2706-90-3	0.02	µg/L		<0.02	<0.02	<0.02	<0.02	----
Perfluorohexanoic acid (PFHxA)	307-24-4	0.02	µg/L		<0.02	<0.02	<0.02	<0.02	----
Perfluoroheptanoic acid (PFHpA)	375-85-9	0.02	µg/L		<0.02	<0.02	<0.02	<0.02	----
Perfluorooctanoic acid (PFOA)	335-67-1	0.01	µg/L		<0.01	<0.01	<0.01	<0.01	----
Perfluorononanoic acid (PFNA)	375-95-1	0.02	µg/L		<0.02	<0.02	<0.02	<0.02	----
Perfluorodecanoic acid (PFDA)	335-76-2	0.02	µg/L		<0.02	<0.02	<0.02	<0.02	----
Perfluoroundecanoic acid (PFUnDA)	2058-94-8	0.02	µg/L		<0.02	<0.02	<0.02	<0.02	----
Perfluorododecanoic acid (PFDoDA)	307-55-1	0.02	µg/L		<0.02	<0.02	<0.02	<0.02	----
Perfluorotridecanoic acid (PFTrDA)	72629-94-8	0.02	µg/L		<0.02	<0.02	<0.02	<0.02	----
Perfluorotetradecanoic acid (PFTeDA)	376-06-7	0.05	µg/L		<0.05	<0.05	<0.05	<0.05	----
EP231C: Perfluoroalkyl Sulfonamides									
Perfluorooctane sulfonamide (FOSA)	754-91-6	0.02	µg/L		<0.02	<0.02	<0.02	<0.02	----
N-Methyl perfluorooctane sulfonamide (MeFOSA)	31506-32-8	0.05	µg/L		<0.05	<0.05	<0.05	<0.05	----
N-Ethyl perfluorooctane sulfonamide (EtFOSA)	4151-50-2	0.05	µg/L		<0.05	<0.05	<0.05	<0.05	----

Analytical Results

Sub-Matrix: DI WATER LEACHATE (Matrix: WATER)				Client sample ID	SS01 DI LEACH	SS02 DI LEACH	SS03 DI LEACH	DUP1 DI LEACH	----
				Client sampling date / time	15-Mar-2017 00:00	15-Mar-2017 00:00	15-Mar-2017 00:00	15-Mar-2017 00:00	----
Compound	CAS Number	LOR	Unit		ES1706190-012	ES1706190-013	ES1706190-014	ES1706190-015	--------
					Result	Result	Result	Result	----
EP231C: Perfluoroalkyl Sulfonamides - Continued									
N-Methyl perfluorooctane sulfonamidoethanol (MeFOSE)	2448-09-7	0.05	µg/L		<0.05	<0.05	<0.05	<0.05	----
N-Ethyl perfluorooctane sulfonamidoethanol (EtFOSE)	1691-99-2	0.05	µg/L		<0.05	<0.05	<0.05	<0.05	----
N-Methyl perfluorooctane sulfonamidoacetic acid (MeFOSAA)	2355-31-9	0.02	µg/L		<0.02	<0.02	<0.02	<0.02	----
N-Ethyl perfluorooctane sulfonamidoacetic acid (EtFOSAA)	2991-50-6	0.02	µg/L		<0.02	<0.02	<0.02	<0.02	----
EP231D: (n:2) Fluorotelomer Sulfonic Acids									
4:2 Fluorotelomer sulfonic acid (4:2 FTS)	757124-72-4	0.05	µg/L		<0.05	<0.05	<0.05	<0.05	----
6:2 Fluorotelomer sulfonic acid (6:2 FTS)	27619-97-2	0.05	µg/L		<0.05	<0.05	<0.05	<0.05	----
8:2 Fluorotelomer sulfonic acid (8:2 FTS)	39108-34-4	0.05	µg/L		<0.05	<0.05	<0.05	<0.05	----
10:2 Fluorotelomer sulfonic acid (10:2 FTS)	120226-60-0	0.05	µg/L		<0.05	<0.05	<0.05	<0.05	----
EP231P: PFAS Sums									
Sum of PFAS	----	0.01	µg/L		**0.04**	**0.01**	**0.02**	**0.03**	----
Sum of PFHxS and PFOS	355-46-4/1763-23-1	0.01	µg/L		**0.04**	**0.01**	**0.02**	**0.03**	----
Sum of PFAS (WA DER List)	----	0.01	µg/L		**0.04**	**0.01**	**0.02**	**0.03**	----
EP231S: PFAS Surrogate									
13C4-PFOS	----	0.02	%		**104**	**103**	**102**	**102**	----

Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)			Client sample ID	SS01 TCLP LEACHATE	SS02 TCLP LEACHATE	SS03 TCLP LEACHATE	DUP1 TCLP LEACHATE	SS01 DI LEACH
			Client sampling date / time	15-Mar-2017 00:00	15-Mar-2017 00:00	15-Mar-2017 00:00	15-Mar-2017 00:00	15-Mar-2017 00:00
Compound	CAS Number	LOR	Unit	ES1706190-006	ES1706190-007	ES1706190-008	ES1706190-009	ES1706190-012
				Result	Result	Result	Result	Result
EA002 : pH (Soils)								
pH Value	----	0.1	pH Unit	7.5	8.1	7.3	7.5	----
EA055: Moisture Content								
Moisture Content (dried @ 103°C)	----	1	%	26.6	24.6	31.8	27.6	----
ED006: Exchangeable Cations on Alkaline Soils								
Exchangeable Calcium	----	0.2	meq/100g	1.6	3.4	2.3	3.4	----
Exchangeable Magnesium	----	0.2	meq/100g	<0.2	<0.2	<0.2	<0.2	----
Exchangeable Potassium	----	0.2	meq/100g	<0.2	<0.2	<0.2	<0.2	----
Exchangeable Sodium	----	0.2	meq/100g	<0.2	<0.2	<0.2	<0.2	----
Cation Exchange Capacity	----	0.2	meq/100g	1.6	3.4	2.3	3.4	----
ED040S : Soluble Sulfate by ICPAES								
Sulfate as SO4 2-	14808-79-8	10	mg/kg	70	20	50	60	----
ED045G: Chloride by Discrete Analyser								
Chloride	16887-00-6	10	mg/kg	20	10	30	20	----
ED093S: Soluble Major Cations								
Calcium	7440-70-2	10	mg/kg	100	40	120	100	----
Magnesium	7439-95-4	10	mg/kg	10	<10	10	10	----
Sodium	7440-23-5	10	mg/kg	20	10	20	20	----
Potassium	7440-09-7	10	mg/kg	10	10	20	10	----
EG005T: Total Metals by ICP-AES								
Arsenic	7440-38-2	5	mg/kg	<5	<5	<5	<5	----
Cadmium	7440-43-9	1	mg/kg	<1	<1	<1	<1	----
Chromium	7440-47-3	2	mg/kg	7	2	5	6	----
Copper	7440-50-8	5	mg/kg	81	34	48	58	----
Lead	7439-92-1	5	mg/kg	75	21	266	48	----
Nickel	7440-02-0	2	mg/kg	7	3	5	5	----
Zinc	7440-66-6	5	mg/kg	294	80	154	207	----
EG035T: Total Recoverable Mercury by FIMS								
Mercury	7439-97-6	0.1	mg/kg	<0.1	<0.1	<0.1	<0.1	----
EN33: TCLP Leach								
Initial pH	----	0.1	pH Unit	8.2	8.7	8.0	8.0	----
After HCl pH	----	0.1	pH Unit	1.6	1.6	1.6	1.6	----
Extraction Fluid Number	----	1	-	1	1	1	1	----
Final pH	----	0.1	pH Unit	5.1	5.1	5.0	5.1	----

Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)				Client sample ID	SS01 TCLP LEACHATE	SS02 TCLP LEACHATE	SS03 TCLP LEACHATE	DUP1 TCLP LEACHATE	SS01 DI LEACH
				Client sampling date / time	15-Mar-2017 00:00	15-Mar-2017 00:00	15-Mar-2017 00:00	15-Mar-2017 00:00	15-Mar-2017 00:00
Compound	CAS Number	LOR	Unit		ES1706190-006	ES1706190-007	ES1706190-008	ES1706190-009	ES1706190-012
					Result	Result	Result	Result	Result
EN60: Bottle Leaching Procedure									
Final pH	----	0.1	pH Unit		----	----	----	----	8.2
EP004: Organic Matter									
Total Organic Carbon	----	0.5	%		1.7	<0.5	1.4	1.2	----
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons									
Naphthalene	91-20-3	0.5	mg/kg		<0.5	<0.5	<0.5	<0.5	----
Acenaphthylene	208-96-8	0.5	mg/kg		<0.5	<0.5	<0.5	<0.5	----
Acenaphthene	83-32-9	0.5	mg/kg		<0.5	<0.5	<0.5	<0.5	----
Fluorene	86-73-7	0.5	mg/kg		<0.5	<0.5	<0.5	<0.5	----
Phenanthrene	85-01-8	0.5	mg/kg		<0.5	<0.5	<0.5	<0.5	----
Anthracene	120-12-7	0.5	mg/kg		<0.5	<0.5	<0.5	<0.5	----
Fluoranthene	206-44-0	0.5	mg/kg		0.8	<0.5	<0.5	<0.5	----
Pyrene	129-00-0	0.5	mg/kg		0.8	<0.5	<0.5	<0.5	----
Benz(a)anthracene	56-55-3	0.5	mg/kg		<0.5	<0.5	<0.5	<0.5	----
Chrysene	218-01-9	0.5	mg/kg		<0.5	<0.5	<0.5	<0.5	----
Benzo(b+j)fluoranthene	205-99-2 205-82-3	0.5	mg/kg		<0.5	<0.5	<0.5	<0.5	----
Benzo(k)fluoranthene	207-08-9	0.5	mg/kg		<0.5	<0.5	<0.5	<0.5	----
Benzo(a)pyrene	50-32-8	0.5	mg/kg		<0.5	<0.5	<0.5	<0.5	----
Indeno(1.2.3.cd)pyrene	193-39-5	0.5	mg/kg		<0.5	<0.5	<0.5	<0.5	----
Dibenz(a.h)anthracene	53-70-3	0.5	mg/kg		<0.5	<0.5	<0.5	<0.5	----
Benzo(g.h.i)perylene	191-24-2	0.5	mg/kg		<0.5	<0.5	<0.5	<0.5	----
^ Sum of polycyclic aromatic hydrocarbons	----	0.5	mg/kg		1.6	<0.5	<0.5	<0.5	----
^ Benzo(a)pyrene TEQ (zero)	----	0.5	mg/kg		<0.5	<0.5	<0.5	<0.5	----
^ Benzo(a)pyrene TEQ (half LOR)	----	0.5	mg/kg		0.6	0.6	0.6	0.6	----
^ Benzo(a)pyrene TEQ (LOR)	----	0.5	mg/kg		1.2	1.2	1.2	1.2	----
EP080/071: Total Petroleum Hydrocarbons									
C6 - C9 Fraction	----	10	mg/kg		<10	<10	<10	<10	----
C10 - C14 Fraction	----	50	mg/kg		<50	<50	<50	<50	----
C15 - C28 Fraction	----	100	mg/kg		210	<100	110	180	----
C29 - C36 Fraction	----	100	mg/kg		170	<100	100	150	----
^ C10 - C36 Fraction (sum)	----	50	mg/kg		380	<50	210	330	----
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions									
C6 - C10 Fraction	C6_C10	10	mg/kg		<10	<10	<10	<10	----
^ C6 - C10 Fraction minus BTEX (F1)	C6_C10-BTEX	10	mg/kg		<10	<10	<10	<10	----

Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)				Client sample ID	SS01 TCLP LEACHATE	SS02 TCLP LEACHATE	SS03 TCLP LEACHATE	DUP1 TCLP LEACHATE	SS01 DI LEACH
				Client sampling date / time	15-Mar-2017 00:00	15-Mar-2017 00:00	15-Mar-2017 00:00	15-Mar-2017 00:00	15-Mar-2017 00:00
Compound	CAS Number	LOR	Unit		ES1706190-006	ES1706190-007	ES1706190-008	ES1706190-009	ES1706190-012
					Result	Result	Result	Result	Result
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions - Continued									
>C10 - C16 Fraction	----	50	mg/kg		<50	<50	<50	<50	----
>C16 - C34 Fraction	----	100	mg/kg		**310**	<100	**160**	**250**	----
>C34 - C40 Fraction	----	100	mg/kg		**120**	<100	<100	**120**	----
^ >C10 - C40 Fraction (sum)	----	50	mg/kg		**430**	<50	**160**	**370**	----
^ >C10 - C16 Fraction minus Naphthalene (F2)	----	50	mg/kg		<50	<50	<50	<50	----
EP080: BTEXN									
Benzene	71-43-2	0.2	mg/kg		<0.2	<0.2	<0.2	<0.2	----
Toluene	108-88-3	0.5	mg/kg		<0.5	<0.5	<0.5	<0.5	----
Ethylbenzene	100-41-4	0.5	mg/kg		<0.5	<0.5	<0.5	<0.5	----
meta- & para-Xylene	108-38-3 106-42-3	0.5	mg/kg		<0.5	<0.5	<0.5	<0.5	----
ortho-Xylene	95-47-6	0.5	mg/kg		<0.5	<0.5	<0.5	<0.5	----
^ Sum of BTEX	----	0.2	mg/kg		<0.2	<0.2	<0.2	<0.2	----
^ Total Xylenes	1330-20-7	0.5	mg/kg		<0.5	<0.5	<0.5	<0.5	----
Naphthalene	91-20-3	1	mg/kg		<1	<1	<1	<1	----
EP231A: Perfluoroalkyl Sulfonic Acids									
Perfluorobutane sulfonic acid (PFBS)	375-73-5	0.0002	mg/kg		<0.0002	<0.0002	<0.0002	<0.0002	----
Perfluoropentane sulfonic acid (PFPeS)	2706-91-4	0.0002	mg/kg		<0.0002	<0.0002	<0.0002	<0.0002	----
Perfluorohexane sulfonic acid (PFHxS)	355-46-4	0.0002	mg/kg		**0.0004**	<0.0002	<0.0002	**0.0003**	----
Perfluoroheptane sulfonic acid (PFHpS)	375-92-8	0.0002	mg/kg		<0.0002	<0.0002	**0.0002**	<0.0002	----
Perfluorooctane sulfonic acid (PFOS)	1763-23-1	0.0002	mg/kg		**0.0018**	**0.0003**	**0.0010**	**0.0024**	----
Perfluorodecane sulfonic acid (PFDS)	335-77-3	0.0002	mg/kg		<0.0002	<0.0002	<0.0002	<0.0002	----
EP231B: Perfluoroalkyl Carboxylic Acids									
Perfluorobutanoic acid (PFBA)	375-22-4	0.001	mg/kg		<0.001	<0.001	<0.001	<0.001	----
Perfluoropentanoic acid (PFPeA)	2706-90-3	0.0002	mg/kg		<0.0002	<0.0002	<0.0002	<0.0002	----
Perfluorohexanoic acid (PFHxA)	307-24-4	0.0002	mg/kg		<0.0002	<0.0002	<0.0002	<0.0002	----
Perfluoroheptanoic acid (PFHpA)	375-85-9	0.0002	mg/kg		<0.0002	<0.0002	<0.0002	<0.0002	----
Perfluorooctanoic acid (PFOA)	335-67-1	0.0002	mg/kg		**0.0003**	<0.0002	<0.0002	**0.0003**	----
Perfluorononanoic acid (PFNA)	375-95-1	0.0002	mg/kg		<0.0002	<0.0002	<0.0002	<0.0002	----

Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)				Client sample ID	SS01 TCLP LEACHATE	SS02 TCLP LEACHATE	SS03 TCLP LEACHATE	DUP1 TCLP LEACHATE	SS01 DI LEACH
				Client sampling date / time	15-Mar-2017 00:00	15-Mar-2017 00:00	15-Mar-2017 00:00	15-Mar-2017 00:00	15-Mar-2017 00:00
Compound	CAS Number	LOR	Unit		ES1706190-006	ES1706190-007	ES1706190-008	ES1706190-009	ES1706190-012
					Result	Result	Result	Result	Result
EP231B: Perfluoroalkyl Carboxylic Acids - Continued									
Perfluorodecanoic acid (PFDA)	335-76-2	0.0002	mg/kg		**0.0005**	<0.0002	**0.0002**	<0.0002	----
Perfluoroundecanoic acid (PFUnDA)	2058-94-8	0.0002	mg/kg		<0.0002	<0.0002	<0.0002	<0.0002	----
Perfluorododecanoic acid (PFDoDA)	307-55-1	0.0002	mg/kg		**0.0012**	**0.0004**	**0.0017**	**0.0012**	----
Perfluorotridecanoic acid (PFTrDA)	72629-94-8	0.0002	mg/kg		<0.0002	<0.0002	<0.0002	<0.0002	----
Perfluorotetradecanoic acid (PFTeDA)	376-06-7	0.0005	mg/kg		<0.0005	<0.0005	<0.0005	<0.0005	----
EP231C: Perfluoroalkyl Sulfonamides									
Perfluorooctane sulfonamide (FOSA)	754-91-6	0.0002	mg/kg		<0.0002	<0.0002	<0.0002	<0.0002	----
N-Methyl perfluorooctane sulfonamide (MeFOSA)	31506-32-8	0.0005	mg/kg		<0.0005	<0.0005	<0.0005	<0.0005	----
N-Ethyl perfluorooctane sulfonamide (EtFOSA)	4151-50-2	0.0005	mg/kg		<0.0005	<0.0005	<0.0005	<0.0005	----
N-Methyl perfluorooctane sulfonamidoethanol (MeFOSE)	2448-09-7	0.0005	mg/kg		<0.0005	<0.0005	<0.0005	<0.0005	----
N-Ethyl perfluorooctane sulfonamidoethanol (EtFOSE)	1691-99-2	0.0005	mg/kg		<0.0005	<0.0005	<0.0005	<0.0005	----
N-Methyl perfluorooctane sulfonamidoacetic acid (MeFOSAA)	2355-31-9	0.0002	mg/kg		<0.0002	<0.0002	<0.0002	<0.0002	----
N-Ethyl perfluorooctane sulfonamidoacetic acid (EtFOSAA)	2991-50-6	0.0002	mg/kg		<0.0002	<0.0002	<0.0002	<0.0002	----
EP231D: (n:2) Fluorotelomer Sulfonic Acids									
4:2 Fluorotelomer sulfonic acid (4:2 FTS)	757124-72-4	0.0005	mg/kg		<0.0005	<0.0005	<0.0005	<0.0005	----
6:2 Fluorotelomer sulfonic acid (6:2 FTS)	27619-97-2	0.0005	mg/kg		<0.0005	<0.0005	<0.0005	<0.0005	----
8:2 Fluorotelomer sulfonic acid (8:2 FTS)	39108-34-4	0.0005	mg/kg		<0.0005	<0.0005	<0.0005	<0.0005	----
10:2 Fluorotelomer sulfonic acid (10:2 FTS)	120226-60-0	0.0005	mg/kg		<0.0005	<0.0005	<0.0005	<0.0005	----

Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)				Client sample ID	SS01 TCLP LEACHATE	SS02 TCLP LEACHATE	SS03 TCLP LEACHATE	DUP1 TCLP LEACHATE	SS01 DI LEACH
				Client sampling date / time	15-Mar-2017 00:00	15-Mar-2017 00:00	15-Mar-2017 00:00	15-Mar-2017 00:00	15-Mar-2017 00:00
Compound	CAS Number	LOR	Unit		ES1706190-006	ES1706190-007	ES1706190-008	ES1706190-009	ES1706190-012
					Result	Result	Result	Result	Result
EP231P: PFAS Sums									
Sum of PFAS	----	0.0002	mg/kg		**0.0042**	**0.0007**	**0.0031**	**0.0042**	**----**
Sum of PFHxS and PFOS	355-46-4/1763-23-1	0.0002	mg/kg		**0.0022**	**0.0003**	**0.0010**	**0.0027**	**----**
Sum of PFAS (WA DER List)	----	0.0002	mg/kg		**0.0025**	**0.0003**	**0.0010**	**0.0030**	**----**
EP075(SIM)S: Phenolic Compound Surrogates									
Phenol-d6	13127-88-3	0.5	%		**79.1**	**82.8**	**77.2**	**78.5**	**----**
2-Chlorophenol-D4	93951-73-6	0.5	%		**82.2**	**88.9**	**81.7**	**82.6**	**----**
2.4.6-Tribromophenol	118-79-6	0.5	%		**83.2**	**81.4**	**79.9**	**82.9**	**----**
EP075(SIM)T: PAH Surrogates									
2-Fluorobiphenyl	321-60-8	0.5	%		**95.6**	**96.4**	**92.1**	**89.8**	**----**
Anthracene-d10	1719-06-8	0.5	%		**95.8**	**99.4**	**93.1**	**95.8**	**----**
4-Terphenyl-d14	1718-51-0	0.5	%		**82.4**	**86.4**	**80.1**	**81.6**	**----**
EP080S: TPH(V)/BTEX Surrogates									
1.2-Dichloroethane-D4	17060-07-0	0.2	%		**76.1**	**86.9**	**74.5**	**78.4**	**----**
Toluene-D8	2037-26-5	0.2	%		**76.6**	**84.6**	**75.5**	**79.7**	**----**
4-Bromofluorobenzene	460-00-4	0.2	%		**78.6**	**86.6**	**77.1**	**81.6**	**----**
EP231S: PFAS Surrogate									
13C4-PFOS	----	0.0002	%		**98.9**	**102**	**91.8**	**90.4**	**----**

Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)			Client sample ID	SS02 DI LEACH	SS03 DI LEACH	DUP1 DI LEACH	----	----
			Client sampling date / time	15-Mar-2017 00:00	15-Mar-2017 00:00	15-Mar-2017 00:00	----	----
Compound	CAS Number	LOR	Unit	ES1706190-013	ES1706190-014	ES1706190-015	--------	--------
				Result	Result	Result	----	----
EN60: Bottle Leaching Procedure								
Final pH	----	0.1	pH Unit	**9.0**	**8.2**	**8.5**	**----**	**----**

Analytical Results

Sub-Matrix: **TCLP LEACHATE** (Matrix: **WATER**)

Compound	CAS Number	LOR	Unit	Client sample ID	SS01 TCLP LEACHATE	SS02 TCLP LEACHATE	SS03 TCLP LEACHATE	DUP1 TCLP LEACHATE	----
				Client sampling date / time	15-Mar-2017 00:00	15-Mar-2017 00:00	15-Mar-2017 00:00	15-Mar-2017 00:00	----
					ES1706190-006	ES1706190-007	ES1706190-008	ES1706190-009	--------
					Result	Result	Result	Result	----
EP231A: Perfluoroalkyl Sulfonic Acids									
Perfluorobutane sulfonic acid (PFBS)	375-73-5	0.02	µg/L		<0.02	<0.02	<0.02	<0.02	----
Perfluoropentane sulfonic acid (PFPeS)	2706-91-4	0.02	µg/L		<0.02	<0.02	<0.02	<0.02	----
Perfluorohexane sulfonic acid (PFHxS)	355-46-4	0.02	µg/L		<0.02	<0.02	<0.02	<0.02	----
Perfluoroheptane sulfonic acid (PFHpS)	375-92-8	0.02	µg/L		<0.02	<0.02	<0.02	<0.02	----
Perfluorooctane sulfonic acid (PFOS)	1763-23-1	0.01	µg/L		**0.03**	**0.01**	**0.01**	**0.02**	----
Perfluorodecane sulfonic acid (PFDS)	335-77-3	0.02	µg/L		<0.02	<0.02	<0.02	<0.02	----
EP231B: Perfluoroalkyl Carboxylic Acids									
Perfluorobutanoic acid (PFBA)	375-22-4	0.1	µg/L		<0.1	<0.1	<0.1	<0.1	----
Perfluoropentanoic acid (PFPeA)	2706-90-3	0.02	µg/L		<0.02	<0.02	<0.02	<0.02	----
Perfluorohexanoic acid (PFHxA)	307-24-4	0.02	µg/L		<0.02	<0.02	<0.02	<0.02	----
Perfluoroheptanoic acid (PFHpA)	375-85-9	0.02	µg/L		<0.02	<0.02	<0.02	<0.02	----
Perfluorooctanoic acid (PFOA)	335-67-1	0.01	µg/L		<0.01	<0.01	<0.01	<0.01	----
Perfluorononanoic acid (PFNA)	375-95-1	0.02	µg/L		<0.02	<0.02	<0.02	<0.02	----
Perfluorodecanoic acid (PFDA)	335-76-2	0.02	µg/L		<0.02	<0.02	<0.02	<0.02	----
Perfluoroundecanoic acid (PFUnDA)	2058-94-8	0.02	µg/L		<0.02	<0.02	<0.02	<0.02	----
Perfluorododecanoic acid (PFDoDA)	307-55-1	0.02	µg/L		<0.02	<0.02	<0.02	<0.02	----
Perfluorotridecanoic acid (PFTrDA)	72629-94-8	0.02	µg/L		<0.02	<0.02	<0.02	<0.02	----
Perfluorotetradecanoic acid (PFTeDA)	376-06-7	0.05	µg/L		<0.05	<0.05	<0.05	<0.05	----
EP231C: Perfluoroalkyl Sulfonamides									
Perfluorooctane sulfonamide (FOSA)	754-91-6	0.02	µg/L		<0.02	<0.02	<0.02	<0.02	----
N-Methyl perfluorooctane sulfonamide (MeFOSA)	31506-32-8	0.05	µg/L		<0.05	<0.05	<0.05	<0.05	----
N-Ethyl perfluorooctane sulfonamide (EtFOSA)	4151-50-2	0.05	µg/L		<0.05	<0.05	<0.05	<0.05	----

Analytical Results

Sub-Matrix: TCLP LEACHATE (Matrix: WATER)				Client sample ID	SS01 TCLP LEACHATE	SS02 TCLP LEACHATE	SS03 TCLP LEACHATE	DUP1 TCLP LEACHATE	----
				Client sampling date / time	15-Mar-2017 00:00	15-Mar-2017 00:00	15-Mar-2017 00:00	15-Mar-2017 00:00	----
Compound	CAS Number	LOR	Unit		ES1706190-006	ES1706190-007	ES1706190-008	ES1706190-009	--------
					Result	Result	Result	Result	----
EP231C: Perfluoroalkyl Sulfonamides - Continued									
N-Methyl perfluorooctane sulfonamidoethanol (MeFOSE)	2448-09-7	0.05	µg/L		<0.05	<0.05	<0.05	<0.05	----
N-Ethyl perfluorooctane sulfonamidoethanol (EtFOSE)	1691-99-2	0.05	µg/L		<0.05	<0.05	<0.05	<0.05	----
N-Methyl perfluorooctane sulfonamidoacetic acid (MeFOSAA)	2355-31-9	0.02	µg/L		<0.02	<0.02	<0.02	<0.02	----
N-Ethyl perfluorooctane sulfonamidoacetic acid (EtFOSAA)	2991-50-6	0.02	µg/L		<0.02	<0.02	<0.02	<0.02	----
EP231D: (n:2) Fluorotelomer Sulfonic Acids									
4:2 Fluorotelomer sulfonic acid (4:2 FTS)	757124-72-4	0.05	µg/L		<0.05	<0.05	<0.05	<0.05	----
6:2 Fluorotelomer sulfonic acid (6:2 FTS)	27619-97-2	0.05	µg/L		<0.05	<0.05	<0.05	<0.05	----
8:2 Fluorotelomer sulfonic acid (8:2 FTS)	39108-34-4	0.05	µg/L		<0.05	<0.05	<0.05	<0.05	----
10:2 Fluorotelomer sulfonic acid (10:2 FTS)	120226-60-0	0.05	µg/L		<0.05	<0.05	<0.05	<0.05	----
EP231P: PFAS Sums									
Sum of PFAS	----	0.01	µg/L		**0.03**	**0.01**	**0.01**	**0.02**	----
Sum of PFHxS and PFOS	355-46-4/1763-23-1	0.01	µg/L		**0.03**	**0.01**	**0.01**	**0.02**	----
Sum of PFAS (WA DER List)	----	0.01	µg/L		**0.03**	**0.01**	**0.01**	**0.02**	----
EP231S: PFAS Surrogate									
13C4-PFOS	----	0.02	%		**99.9**	**107**	**105**	**102**	----

Analytical Results

Sub-Matrix: WATER (Matrix: WATER)			Client sample ID	SW01	SW02	SW03	SW04	DUP1
			Client sampling date / time	15-Mar-2017 00:00	15-Mar-2017 00:00	15-Mar-2017 00:00	15-Mar-2017 00:00	15-Mar-2017 00:00
Compound	CAS Number	LOR	Unit	ES1706190-001	ES1706190-002	ES1706190-003	ES1706190-004	ES1706190-005
				Result	Result	Result	Result	Result
EA005P: pH by PC Titrator								
pH Value	----	0.01	pH Unit	8.14	7.99	7.74	8.06	8.14
EA015: Total Dissolved Solids dried at 180 ± 5 °C								
Total Dissolved Solids @180°C	----	10	mg/L	231	212	214	217	240
ED037P: Alkalinity by PC Titrator								
Hydroxide Alkalinity as CaCO3	DMO-210-001	1	mg/L	<1	<1	<1	<1	<1
Carbonate Alkalinity as CaCO3	3812-32-6	1	mg/L	<1	<1	<1	<1	<1
Bicarbonate Alkalinity as CaCO3	71-52-3	1	mg/L	86	102	68	75	84
Total Alkalinity as CaCO3	----	1	mg/L	86	102	68	75	84
ED041G: Sulfate (Turbidimetric) as SO4 2- by DA								
Sulfate as SO4 - Turbidimetric	14808-79-8	1	mg/L	30	30	29	31	34
ED045G: Chloride by Discrete Analyser								
Chloride	16887-00-6	1	mg/L	22	22	21	21	22
ED093F: Dissolved Major Cations								
Calcium	7440-70-2	1	mg/L	26	28	24	25	28
Magnesium	7439-95-4	1	mg/L	4	4	4	4	4
Sodium	7440-23-5	1	mg/L	21	20	17	20	20
Potassium	7440-09-7	1	mg/L	12	10	8	11	11
EG020F: Dissolved Metals by ICP-MS								
Arsenic	7440-38-2	0.001	mg/L	0.003	0.002	0.003	0.002	0.002
Cadmium	7440-43-9	0.0001	mg/L	<0.0001	<0.0001	0.0001	0.0001	<0.0001
Chromium	7440-47-3	0.001	mg/L	0.002	0.002	0.002	0.002	0.001
Copper	7440-50-8	0.001	mg/L	0.006	0.007	0.008	0.006	0.007
Lead	7439-92-1	0.001	mg/L	<0.001	0.001	0.001	0.001	0.001
Nickel	7440-02-0	0.001	mg/L	0.001	0.001	0.001	0.001	0.001
Zinc	7440-66-6	0.005	mg/L	0.016	0.018	0.022	0.014	0.022
EG020T: Total Metals by ICP-MS								
Arsenic	7440-38-2	0.001	mg/L	0.004	0.004	0.003	0.003	0.003
Cadmium	7440-43-9	0.0001	mg/L	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Chromium	7440-47-3	0.001	mg/L	0.005	0.005	0.004	0.005	0.005
Copper	7440-50-8	0.001	mg/L	0.032	0.034	0.029	0.021	0.030
Nickel	7440-02-0	0.001	mg/L	0.003	0.003	0.004	0.002	0.003
Lead	7439-92-1	0.001	mg/L	0.029	0.026	0.024	0.020	0.027
Zinc	7440-66-6	0.005	mg/L	0.114	0.110	0.121	0.094	0.115
EG035F: Dissolved Mercury by FIMS								

Analytical Results

Sub-Matrix: WATER (Matrix: WATER)				Client sample ID	SW01	SW02	SW03	SW04	DUP1
				Client sampling date / time	15-Mar-2017 00:00	15-Mar-2017 00:00	15-Mar-2017 00:00	15-Mar-2017 00:00	15-Mar-2017 00:00
Compound	CAS Number	LOR	Unit		ES1706190-001	ES1706190-002	ES1706190-003	ES1706190-004	ES1706190-005
					Result	Result	Result	Result	Result
EG035F: Dissolved Mercury by FIMS - Continued									
Mercury	7439-97-6	0.0001	mg/L		<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
EG035T: Total Recoverable Mercury by FIMS									
Mercury	7439-97-6	0.0001	mg/L		<0.0001	**0.0001**	<0.0001	<0.0001	<0.0001
EN055: Ionic Balance									
Total Anions	----	0.01	meq/L		**2.96**	**3.28**	**2.55**	**2.74**	**3.01**
Total Cations	----	0.01	meq/L		**2.85**	**2.85**	**2.47**	**2.73**	**2.88**
EP005: Total Organic Carbon (TOC)									
Total Organic Carbon	----	1	mg/L		**10**	**11**	**10**	**10**	**10**
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons									
Naphthalene	91-20-3	1	µg/L		<1.0	<1.0	<1.0	<1.0	<1.0
Acenaphthylene	208-96-8	1	µg/L		<1.0	<1.0	<1.0	<1.0	<1.0
Acenaphthene	83-32-9	1	µg/L		<1.0	<1.0	<1.0	<1.0	<1.0
Fluorene	86-73-7	1	µg/L		<1.0	<1.0	<1.0	<1.0	<1.0
Phenanthrene	85-01-8	1	µg/L		<1.0	<1.0	<1.0	<1.0	<1.0
Anthracene	120-12-7	1	µg/L		<1.0	<1.0	<1.0	<1.0	<1.0
Fluoranthene	206-44-0	1	µg/L		<1.0	<1.0	<1.0	<1.0	<1.0
Pyrene	129-00-0	1	µg/L		<1.0	<1.0	<1.0	<1.0	<1.0
Benz(a)anthracene	56-55-3	1	µg/L		<1.0	<1.0	<1.0	<1.0	<1.0
Chrysene	218-01-9	1	µg/L		<1.0	<1.0	<1.0	<1.0	<1.0
Benzo(b+j)fluoranthene	205-99-2 205-82-3	1	µg/L		<1.0	<1.0	<1.0	<1.0	<1.0
Benzo(k)fluoranthene	207-08-9	1	µg/L		<1.0	<1.0	<1.0	<1.0	<1.0
Benzo(a)pyrene	50-32-8	0.5	µg/L		<0.5	<0.5	<0.5	<0.5	<0.5
Indeno(1.2.3.cd)pyrene	193-39-5	1	µg/L		<1.0	<1.0	<1.0	<1.0	<1.0
Dibenz(a.h)anthracene	53-70-3	1	µg/L		<1.0	<1.0	<1.0	<1.0	<1.0
Benzo(g.h.i)perylene	191-24-2	1	µg/L		<1.0	<1.0	<1.0	<1.0	<1.0
^ Sum of polycyclic aromatic hydrocarbons	----	0.5	µg/L		<0.5	<0.5	<0.5	<0.5	<0.5
^ Benzo(a)pyrene TEQ (zero)	----	0.5	µg/L		<0.5	<0.5	<0.5	<0.5	<0.5
EP080/071: Total Petroleum Hydrocarbons									
C6 - C9 Fraction	----	20	µg/L		<20	<20	<20	<20	<20
C10 - C14 Fraction	----	50	µg/L		<50	<50	<50	<50	<50
C15 - C28 Fraction	----	100	µg/L		<100	<100	<100	<100	<100
C29 - C36 Fraction	----	50	µg/L		<50	<50	<50	<50	<50
^ C10 - C36 Fraction (sum)	----	50	µg/L		<50	<50	<50	<50	<50
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions									

Analytical Results

Sub-Matrix: WATER (Matrix: WATER)				Client sample ID	SW01	SW02	SW03	SW04	DUP1
				Client sampling date / time	15-Mar-2017 00:00	15-Mar-2017 00:00	15-Mar-2017 00:00	15-Mar-2017 00:00	15-Mar-2017 00:00
Compound	CAS Number	LOR	Unit		ES1706190-001	ES1706190-002	ES1706190-003	ES1706190-004	ES1706190-005
					Result	Result	Result	Result	Result
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions - Continued									
C6 - C10 Fraction	C6_C10	20	µg/L		<20	<20	<20	<20	<20
^ **C6 - C10 Fraction minus BTEX (F1)**	C6_C10-BTEX	20	µg/L		<20	<20	<20	<20	<20
>C10 - C16 Fraction	----	100	µg/L		<100	<100	<100	<100	<100
>C16 - C34 Fraction	----	100	µg/L		<100	<100	<100	<100	<100
>C34 - C40 Fraction	----	100	µg/L		<100	<100	<100	<100	<100
^ **>C10 - C40 Fraction (sum)**	----	100	µg/L		<100	<100	<100	<100	<100
^ **>C10 - C16 Fraction minus Naphthalene (F2)**	----	100	µg/L		<100	<100	<100	<100	<100
EP080: BTEXN									
Benzene	71-43-2	1	µg/L		<1	<1	<1	<1	<1
Toluene	108-88-3	2	µg/L		<2	<2	<2	<2	<2
Ethylbenzene	100-41-4	2	µg/L		<2	<2	<2	<2	<2
meta- & para-Xylene	108-38-3 106-42-3	2	µg/L		<2	<2	<2	<2	<2
ortho-Xylene	95-47-6	2	µg/L		<2	<2	<2	<2	<2
^ **Total Xylenes**	1330-20-7	2	µg/L		<2	<2	<2	<2	<2
^ **Sum of BTEX**	----	1	µg/L		<1	<1	<1	<1	<1
Naphthalene	91-20-3	5	µg/L		<5	<5	<5	<5	<5
EP231A: Perfluoroalkyl Sulfonic Acids									
Perfluorobutane sulfonic acid (PFBS)	375-73-5	0.02	µg/L		<0.02	<0.02	<0.02	<0.02	<0.02
Perfluoropentane sulfonic acid (PFPeS)	2706-91-4	0.02	µg/L		<0.02	<0.02	<0.02	<0.02	<0.02
Perfluorohexane sulfonic acid (PFHxS)	355-46-4	0.02	µg/L		<0.02	**0.03**	**0.05**	<0.02	<0.02
Perfluoroheptane sulfonic acid (PFHpS)	375-92-8	0.02	µg/L		<0.02	<0.02	<0.02	<0.02	<0.02
Perfluorooctane sulfonic acid (PFOS)	1763-23-1	0.01	µg/L		<0.01	**0.07**	**0.14**	**0.01**	<0.01
Perfluorodecane sulfonic acid (PFDS)	335-77-3	0.02	µg/L		<0.02	<0.02	<0.02	<0.02	<0.02
EP231B: Perfluoroalkyl Carboxylic Acids									
Perfluorobutanoic acid (PFBA)	375-22-4	0.1	µg/L		<0.1	<0.1	<0.1	<0.1	<0.1
Perfluoropentanoic acid (PFPeA)	2706-90-3	0.02	µg/L		<0.02	<0.02	<0.02	<0.02	<0.02
Perfluorohexanoic acid (PFHxA)	307-24-4	0.02	µg/L		<0.02	<0.02	<0.02	<0.02	<0.02

Analytical Results

Sub-Matrix: WATER (Matrix: WATER)				Client sample ID	SW01	SW02	SW03	SW04	DUP1
				Client sampling date / time	15-Mar-2017 00:00	15-Mar-2017 00:00	15-Mar-2017 00:00	15-Mar-2017 00:00	15-Mar-2017 00:00
Compound	CAS Number	LOR	Unit		ES1706190-001	ES1706190-002	ES1706190-003	ES1706190-004	ES1706190-005
					Result	Result	Result	Result	Result
EP231B: Perfluoroalkyl Carboxylic Acids - Continued									
Perfluoroheptanoic acid (PFHpA)	375-85-9	0.02	µg/L		<0.02	<0.02	<0.02	<0.02	<0.02
Perfluorooctanoic acid (PFOA)	335-67-1	0.01	µg/L		<0.01	**0.02**	**0.04**	**0.03**	<0.01
Perfluorononanoic acid (PFNA)	375-95-1	0.02	µg/L		<0.02	<0.02	<0.02	<0.02	<0.02
Perfluorodecanoic acid (PFDA)	335-76-2	0.02	µg/L		<0.02	<0.02	<0.02	<0.02	<0.02
Perfluoroundecanoic acid (PFUnDA)	2058-94-8	0.02	µg/L		<0.02	<0.02	<0.02	<0.02	<0.02
Perfluorododecanoic acid (PFDoDA)	307-55-1	0.02	µg/L		<0.02	<0.02	<0.02	<0.02	<0.02
Perfluorotridecanoic acid (PFTrDA)	72629-94-8	0.02	µg/L		<0.02	<0.02	<0.02	<0.02	<0.02
Perfluorotetradecanoic acid (PFTeDA)	376-06-7	0.05	µg/L		<0.05	<0.05	<0.05	<0.05	<0.05
EP231C: Perfluoroalkyl Sulfonamides									
Perfluorooctane sulfonamide (FOSA)	754-91-6	0.02	µg/L		<0.02	<0.02	<0.02	<0.02	<0.02
N-Methyl perfluorooctane sulfonamide (MeFOSA)	31506-32-8	0.05	µg/L		<0.05	<0.05	<0.05	<0.05	<0.05
N-Ethyl perfluorooctane sulfonamide (EtFOSA)	4151-50-2	0.05	µg/L		<0.05	<0.05	<0.05	<0.05	<0.05
N-Methyl perfluorooctane sulfonamidoethanol (MeFOSE)	2448-09-7	0.05	µg/L		<0.05	<0.05	<0.05	<0.05	<0.05
N-Ethyl perfluorooctane sulfonamidoethanol (EtFOSE)	1691-99-2	0.05	µg/L		<0.05	<0.05	<0.05	<0.05	<0.05
N-Methyl perfluorooctane sulfonamidoacetic acid (MeFOSAA)	2355-31-9	0.02	µg/L		<0.02	<0.02	<0.02	<0.02	<0.02
N-Ethyl perfluorooctane sulfonamidoacetic acid (EtFOSAA)	2991-50-6	0.02	µg/L		<0.02	<0.02	<0.02	<0.02	<0.02
EP231D: (n:2) Fluorotelomer Sulfonic Acids									
4:2 Fluorotelomer sulfonic acid (4:2 FTS)	757124-72-4	0.05	µg/L		<0.05	<0.05	<0.05	<0.05	<0.05
6:2 Fluorotelomer sulfonic acid (6:2 FTS)	27619-97-2	0.05	µg/L		<0.05	<0.05	<0.05	<0.05	<0.05
8:2 Fluorotelomer sulfonic acid (8:2 FTS)	39108-34-4	0.05	µg/L		<0.05	<0.05	<0.05	<0.05	<0.05

Analytical Results

Sub-Matrix: WATER (Matrix: WATER)				Client sample ID	SW01	SW02	SW03	SW04	DUP1
				Client sampling date / time	15-Mar-2017 00:00	15-Mar-2017 00:00	15-Mar-2017 00:00	15-Mar-2017 00:00	15-Mar-2017 00:00
Compound	CAS Number	LOR	Unit		ES1706190-001	ES1706190-002	ES1706190-003	ES1706190-004	ES1706190-005
					Result	Result	Result	Result	Result
EP231D: (n:2) Fluorotelomer Sulfonic Acids - Continued									
10:2 Fluorotelomer sulfonic acid (10:2 FTS)	120226-60-0	0.05	µg/L		<0.05	<0.05	<0.05	<0.05	<0.05
EP231P: PFAS Sums									
Sum of PFAS	----	0.01	µg/L		<0.01	**0.12**	**0.23**	**0.04**	<0.01
Sum of PFHxS and PFOS	355-46-4/1763-23-1	0.01	µg/L		<0.01	**0.10**	**0.19**	**0.01**	<0.01
Sum of PFAS (WA DER List)	----	0.01	µg/L		<0.01	**0.12**	**0.23**	**0.04**	<0.01
EP075(SIM)S: Phenolic Compound Surrogates									
Phenol-d6	13127-88-3	1	%		**24.1**	**23.1**	**27.0**	**22.0**	**20.8**
2-Chlorophenol-D4	93951-73-6	1	%		**46.3**	**47.7**	**52.8**	**41.2**	**38.3**
2.4.6-Tribromophenol	118-79-6	1	%		**52.3**	**51.0**	**73.7**	**45.8**	**47.6**
EP075(SIM)T: PAH Surrogates									
2-Fluorobiphenyl	321-60-8	1	%		**64.0**	**54.0**	**57.2**	**51.2**	**57.2**
Anthracene-d10	1719-06-8	1	%		**75.3**	**87.2**	**80.8**	**88.6**	**85.9**
4-Terphenyl-d14	1718-51-0	1	%		**71.8**	**68.6**	**88.2**	**63.2**	**57.4**
EP080S: TPH(V)/BTEX Surrogates									
1.2-Dichloroethane-D4	17060-07-0	2	%		**113**	**109**	**107**	**111**	**115**
Toluene-D8	2037-26-5	2	%		**117**	**114**	**109**	**109**	**116**
4-Bromofluorobenzene	460-00-4	2	%		**110**	**109**	**103**	**107**	**114**
EP231S: PFAS Surrogate									
13C4-PFOS	----	0.02	%		**79.0**	**80.0**	**89.4**	**81.0**	**84.2**

Analytical Results

Sub-Matrix: WATER (Matrix: WATER)				Client sample ID	TS	SP_450_01	----	----	----
				Client sampling date / time	15-Mar-2017 00:00	15-Mar-2017 00:00	----	----	----
Compound	CAS Number	LOR	Unit		ES1706190-010	ES1706190-011	--------	--------	--------
					Result	Result	----	----	----
EA005P: pH by PC Titrator									
pH Value	----	0.01	pH Unit		----	7.15	----	----	----
EA015: Total Dissolved Solids dried at 180 ± 5 °C									
Total Dissolved Solids @180°C	----	10	mg/L		----	59	----	----	----
ED037P: Alkalinity by PC Titrator									
Hydroxide Alkalinity as CaCO3	DMO-210-001	1	mg/L		----	<1	----	----	----
Carbonate Alkalinity as CaCO3	3812-32-6	1	mg/L		----	<1	----	----	----
Bicarbonate Alkalinity as CaCO3	71-52-3	1	mg/L		----	17	----	----	----
Total Alkalinity as CaCO3	----	1	mg/L		----	17	----	----	----
ED041G: Sulfate (Turbidimetric) as SO4 2- by DA									
Sulfate as SO4 - Turbidimetric	14808-79-8	1	mg/L		----	4	----	----	----
ED045G: Chloride by Discrete Analyser									
Chloride	16887-00-6	1	mg/L		----	12	----	----	----
ED093F: Dissolved Major Cations									
Calcium	7440-70-2	1	mg/L		----	6	----	----	----
Magnesium	7439-95-4	1	mg/L		----	2	----	----	----
Sodium	7440-23-5	1	mg/L		----	7	----	----	----
Potassium	7440-09-7	1	mg/L		----	<1	----	----	----
EN055: Ionic Balance									
Total Anions	----	0.01	meq/L		----	0.76	----	----	----
Total Cations	----	0.01	meq/L		----	0.77	----	----	----
EP005: Total Organic Carbon (TOC)									
Total Organic Carbon	----	1	mg/L		----	2	----	----	----
EP080: BTEXN									
Benzene	71-43-2	1	µg/L		16	----	----	----	----
Toluene	108-88-3	2	µg/L		15	----	----	----	----
Ethylbenzene	100-41-4	2	µg/L		14	----	----	----	----
meta- & para-Xylene	108-38-3 106-42-3	2	µg/L		14	----	----	----	----
ortho-Xylene	95-47-6	2	µg/L		15	----	----	----	----
^ Total Xylenes	1330-20-7	2	µg/L		29	----	----	----	----
^ Sum of BTEX	----	1	µg/L		74	----	----	----	----
Naphthalene	91-20-3	5	µg/L		18	----	----	----	----
EP231A: Perfluoroalkyl Sulfonic Acids									
Perfluorobutane sulfonic acid (PFBS)	375-73-5	0.02	µg/L		----	<0.02	----	----	----

Analytical Results

Sub-Matrix: WATER (Matrix: WATER)				Client sample ID	TS	SP_450_01	----	----	----
				Client sampling date / time	15-Mar-2017 00:00	15-Mar-2017 00:00	----	----	----
Compound	CAS Number	LOR	Unit		ES1706190-010	ES1706190-011	--------	--------	--------
					Result	Result	----	----	----
EP231A: Perfluoroalkyl Sulfonic Acids - Continued									
Perfluoropentane sulfonic acid (PFPeS)	2706-91-4	0.02	µg/L		----	<0.02	----	----	----
Perfluorohexane sulfonic acid (PFHxS)	355-46-4	0.02	µg/L		----	**0.19**	----	----	----
Perfluoroheptane sulfonic acid (PFHpS)	375-92-8	0.02	µg/L		----	<0.02	----	----	----
Perfluorooctane sulfonic acid (PFOS)	1763-23-1	0.01	µg/L		----	**0.70**	----	----	----
Perfluorodecane sulfonic acid (PFDS)	335-77-3	0.02	µg/L		----	<0.02	----	----	----
EP231B: Perfluoroalkyl Carboxylic Acids									
Perfluorobutanoic acid (PFBA)	375-22-4	0.1	µg/L		----	<0.1	----	----	----
Perfluoropentanoic acid (PFPeA)	2706-90-3	0.02	µg/L		----	**0.02**	----	----	----
Perfluorohexanoic acid (PFHxA)	307-24-4	0.02	µg/L		----	**0.05**	----	----	----
Perfluoroheptanoic acid (PFHpA)	375-85-9	0.02	µg/L		----	<0.02	----	----	----
Perfluorooctanoic acid (PFOA)	335-67-1	0.01	µg/L		----	**0.02**	----	----	----
Perfluorononanoic acid (PFNA)	375-95-1	0.02	µg/L		----	<0.02	----	----	----
Perfluorodecanoic acid (PFDA)	335-76-2	0.02	µg/L		----	<0.02	----	----	----
Perfluoroundecanoic acid (PFUnDA)	2058-94-8	0.02	µg/L		----	<0.02	----	----	----
Perfluorododecanoic acid (PFDoDA)	307-55-1	0.02	µg/L		----	<0.02	----	----	----
Perfluorotridecanoic acid (PFTrDA)	72629-94-8	0.02	µg/L		----	<0.02	----	----	----
Perfluorotetradecanoic acid (PFTeDA)	376-06-7	0.05	µg/L		----	<0.05	----	----	----
EP231C: Perfluoroalkyl Sulfonamides									
Perfluorooctane sulfonamide (FOSA)	754-91-6	0.02	µg/L		----	<0.02	----	----	----
N-Methyl perfluorooctane sulfonamide (MeFOSA)	31506-32-8	0.05	µg/L		----	<0.05	----	----	----
N-Ethyl perfluorooctane sulfonamide (EtFOSA)	4151-50-2	0.05	µg/L		----	<0.05	----	----	----
N-Methyl perfluorooctane sulfonamidoethanol (MeFOSE)	2448-09-7	0.05	µg/L		----	<0.05	----	----	----

Analytical Results

Sub-Matrix: WATER (Matrix: WATER)				Client sample ID	TS	SP_450_01	----	----	----
				Client sampling date / time	15-Mar-2017 00:00	15-Mar-2017 00:00	----	----	----
Compound	CAS Number	LOR	Unit		ES1706190-010	ES1706190-011	--------	--------	--------
					Result	Result	----	----	----
EP231C: Perfluoroalkyl Sulfonamides - Continued									
N-Ethyl perfluorooctane sulfonamidoethanol (EtFOSE)	1691-99-2	0.05	µg/L		----	<0.05	----	----	----
N-Methyl perfluorooctane sulfonamidoacetic acid (MeFOSAA)	2355-31-9	0.02	µg/L		----	<0.02	----	----	----
N-Ethyl perfluorooctane sulfonamidoacetic acid (EtFOSAA)	2991-50-6	0.02	µg/L		----	<0.02	----	----	----
EP231D: (n:2) Fluorotelomer Sulfonic Acids									
4:2 Fluorotelomer sulfonic acid (4:2 FTS)	757124-72-4	0.05	µg/L		----	<0.05	----	----	----
6:2 Fluorotelomer sulfonic acid (6:2 FTS)	27619-97-2	0.05	µg/L		----	**0.50**	----	----	----
8:2 Fluorotelomer sulfonic acid (8:2 FTS)	39108-34-4	0.05	µg/L		----	**0.05**	----	----	----
10:2 Fluorotelomer sulfonic acid (10:2 FTS)	120226-60-0	0.05	µg/L		----	<0.05	----	----	----
EP231P: PFAS Sums									
Sum of PFAS	----	0.01	µg/L		----	**1.53**	----	----	----
Sum of PFHxS and PFOS	355-46-4/1763-23-1	0.01	µg/L		----	**0.89**	----	----	----
Sum of PFAS (WA DER List)	----	0.01	µg/L		----	**1.53**	----	----	----
EP080S: TPH(V)/BTEX Surrogates									
1.2-Dichloroethane-D4	17060-07-0	2	%		**102**	----	----	----	----
Toluene-D8	2037-26-5	2	%		**106**	----	----	----	----
4-Bromofluorobenzene	460-00-4	2	%		**111**	----	----	----	----
EP231S: PFAS Surrogate									
13C4-PFOS	----	0.02	%		----	**81.6**	----	----	----

Surrogate Control Limits

Sub-Matrix: DI WATER LEACHATE		Recovery Limits (%)	
Compound	CAS Number	Low	High
EP231S: PFAS Surrogate			
13C4-PFOS	----	60	130

Sub-Matrix: SOIL		Recovery Limits (%)	
Compound	CAS Number	Low	High
EP075(SIM)S: Phenolic Compound Surrogates			
Phenol-d6	13127-88-3	63	123
2-Chlorophenol-D4	93951-73-6	66	122
2.4.6-Tribromophenol	118-79-6	40	138
EP075(SIM)T: PAH Surrogates			
2-Fluorobiphenyl	321-60-8	70	122
Anthracene-d10	1719-06-8	66	128
4-Terphenyl-d14	1718-51-0	65	129
EP080S: TPH(V)/BTEX Surrogates			
1.2-Dichloroethane-D4	17060-07-0	73	133
Toluene-D8	2037-26-5	74	132
4-Bromofluorobenzene	460-00-4	72	130
EP231S: PFAS Surrogate			
13C4-PFOS	----	70	130

Sub-Matrix: TCLP LEACHATE		Recovery Limits (%)	
Compound	CAS Number	Low	High
EP231S: PFAS Surrogate			
13C4-PFOS	----	60	130

Sub-Matrix: WATER		Recovery Limits (%)	
Compound	CAS Number	Low	High
EP075(SIM)S: Phenolic Compound Surrogates			
Phenol-d6	13127-88-3	10	44
2-Chlorophenol-D4	93951-73-6	14	94
2.4.6-Tribromophenol	118-79-6	17	125
EP075(SIM)T: PAH Surrogates			
2-Fluorobiphenyl	321-60-8	20	104
Anthracene-d10	1719-06-8	27	113
4-Terphenyl-d14	1718-51-0	32	112
EP080S: TPH(V)/BTEX Surrogates			
1.2-Dichloroethane-D4	17060-07-0	71	137
Toluene-D8	2037-26-5	79	131
4-Bromofluorobenzene	460-00-4	70	128
EP231S: PFAS Surrogate			

Sub-Matrix: **WATER**

Compound	CAS Number	Recovery Limits (%) Low	Recovery Limits (%) High
EP231S: PFAS Surrogate - Continued			
13C4-PFOS	----	60	130

ALS Environmental

QUALITY CONTROL REPORT

Work Order	: **ES1706190**	Page	: 1 of 25
Client	: **GHD PTY LTD**	Laboratory	: Environmental Division Sydney
Contact	: MR BEN ANDERSON	Contact	: Vanessa Mattes
Address	: LEVEL 15, 133 CASTLEREAGH STREET SYDNEY NSW, AUSTRALIA 2000	Address	: 277-289 Woodpark Road Smithfield NSW Australia 2164
Telephone	: +61 08 6222 8222	Telephone	: +61-2-8784 8555
Project	: 21-25583-03 ALEXANDRIA	Date Samples Received	: 15-Mar-2017
Order number	: ----	Date Analysis Commenced	: 16-Mar-2017
C-O-C number	: ----	Issue Date	: 23-Mar-2017
Sampler	: DYLAN GALT		
Site	: ----		
Quote number	: EN/005/15		
No. of samples received	: 15		
No. of samples analysed	: 15		

Accreditation No. 825
Accredited for compliance with
ISO/IEC 17025 - Testing

This report supersedes any previous report(s) with this reference. Results apply to the sample(s) as submitted. This document shall not be reproduced, except in full.

This Quality Control Report contains the following information:

- Laboratory Duplicate (DUP) Report; Relative Percentage Difference (RPD) and Acceptance Limits
- Method Blank (MB) and Laboratory Control Spike (LCS) Report; Recovery and Acceptance Limits
- Matrix Spike (MS) Report; Recovery and Acceptance Limits

Signatories

This document has been electronically signed by the authorized signatories below. Electronic signing is carried out in compliance with procedures specified in 21 CFR Part 11.

Signatories	*Position*	*Accreditation Category*
Alex Rossi	Organic Chemist	Sydney Organics, Smithfield, NSW
Ankit Joshi	Inorganic Chemist	Sydney Inorganics, Smithfield, NSW
Dian Dao		Sydney Inorganics, Smithfield, NSW
Edwandy Fadjar	Organic Coordinator	Sydney Inorganics, Smithfield, NSW
Edwandy Fadjar	Organic Coordinator	Sydney Organics, Smithfield, NSW
Lana Nguyen	Senior LCMS Chemist	Sydney Organics, Smithfield, NSW
Raymond Commodore	Instrument Chemist	Sydney Inorganics, Smithfield, NSW
Sanjeshni Jyoti	Senior Chemist Volatiles	Sydney Organics, Smithfield, NSW
Wisam Marassa	Inorganics Coordinator	Sydney Inorganics, Smithfield, NSW

General Comments

The analytical procedures used by the Environmental Division have been developed from established internationally recognized procedures such as those published by the USEPA, APHA, AS and NEPM. In house developed procedures are employed in the absence of documented standards or by client request.

Where moisture determination has been performed, results are reported on a dry weight basis.

Where a reported less than (<) result is higher than the LOR, this may be due to primary sample extract/digestate dilution and/or insufficient sample for analysis. Where the LOR of a reported result differs from standard LOR, this may be due to high

Key : Anonymous = Refers to samples which are not specifically part of this work order but formed part of the QC process lot
CAS Number = CAS registry number from database maintained by Chemical Abstracts Services. The Chemical Abstracts Service is a division of the American Chemical Society.
LOR = Limit of reporting
RPD = Relative Percentage Difference
# = Indicates failed QC

Laboratory Duplicate (DUP) Report

The quality control term Laboratory Duplicate refers to a randomly selected intralaboratory split. Laboratory duplicates provide information regarding method precision and sample heterogeneity. The permitted ranges for the Relative Percent Deviation (RPD) of Laboratory Duplicates are specified in ALS Method QWI-EN/38 and are dependent on the magnitude of results in comparison to the level of reporting: Result < 10 times LOR: No Limit; Result between 10 and 20 times LOR: 0% - 50%; Result > 20 times LOR: 0% - 20%.

Sub-Matrix: **SOIL**

				Laboratory Duplicate (DUP) Report					
Laboratory sample ID	*Client sample ID*	*Method: Compound*	*CAS Number*	*LOR*	*Unit*	*Original Result*	*Duplicate Result*	*RPD (%)*	*Recovery Limits (%)*
EA002 : pH (Soils) (QC Lot: 800747)									
ES1706078-003	Anonymous	EA002: pH Value	----	0.1	pH Unit	8.2	8.3	0.00	0% - 20%
EA055: Moisture Content (QC Lot: 794884)									
ES1706087-002	Anonymous	EA055-103: Moisture Content (dried @ 103°C)	----	1	%	13.2	13.5	1.96	0% - 50%
ES1706190-006	SS01 TCLP LEACHATE	EA055-103: Moisture Content (dried @ 103°C)	----	1	%	26.6	25.9	2.58	0% - 20%
ED006: Exchangeable Cations on Alkaline Soils (QC Lot: 803331)									
ES1706190-006	SS01 TCLP LEACHATE	ED006: Exchangeable Calcium	----	0.1	meq/100g	1.6	1.3	16.8	No Limit
		ED006: Exchangeable Magnesium	----	0.1	meq/100g	<0.2	<0.2	0.00	No Limit
		ED006: Exchangeable Potassium	----	0.1	meq/100g	<0.2	<0.2	0.00	No Limit
		ED006: Exchangeable Sodium	----	0.1	meq/100g	<0.2	<0.2	0.00	No Limit
		ED006: Cation Exchange Capacity	----	0.1	meq/100g	1.6	1.3	16.8	No Limit
ED040S: Soluble Major Anions (QC Lot: 800743)									
ES1706565-005	Anonymous	ED040S: Sulfate as SO4 2-	14808-79-8	10	mg/kg	90	70	30.0	No Limit
ES1705860-004	Anonymous	ED040S: Sulfate as SO4 2-	14808-79-8	10	mg/kg	400	390	0.00	0% - 20%
ED045G: Chloride by Discrete Analyser (QC Lot: 800744)									
ES1705860-004	Anonymous	ED045G: Chloride	16887-00-6	10	mg/kg	140	130	0.00	0% - 50%
ES1706078-003	Anonymous	ED045G: Chloride	16887-00-6	10	mg/kg	12800	12800	0.155	0% - 20%
ED093S: Soluble Major Cations (QC Lot: 800745)									
ES1705860-004	Anonymous	ED093S: Calcium	7440-70-2	10	mg/kg	40	40	0.00	No Limit
		ED093S: Magnesium	7439-95-4	10	mg/kg	50	40	0.00	No Limit
		ED093S: Sodium	7440-23-5	10	mg/kg	340	320	4.77	0% - 20%
		ED093S: Potassium	7440-09-7	10	mg/kg	60	60	0.00	No Limit
EG005T: Total Metals by ICP-AES (QC Lot: 797415)									
ES1706074-002	Anonymous	EG005T: Cadmium	7440-43-9	1	mg/kg	<1	<1	0.00	No Limit
		EG005T: Chromium	7440-47-3	2	mg/kg	4	3	0.00	No Limit

Sub-Matrix: **SOIL**

				Laboratory Duplicate (DUP) Report					
Laboratory sample ID	*Client sample ID*	*Method: Compound*	*CAS Number*	*LOR*	*Unit*	*Original Result*	*Duplicate Result*	*RPD (%)*	*Recovery Limits (%)*
EG005T: Total Metals by ICP-AES (QC Lot: 797415) - continued									
ES1706074-002	Anonymous	EG005T: Nickel	7440-02-0	2	mg/kg	6	7	0.00	No Limit
		EG005T: Arsenic	7440-38-2	5	mg/kg	<5	<5	0.00	No Limit
		EG005T: Copper	7440-50-8	5	mg/kg	11	14	18.0	No Limit
		EG005T: Lead	7439-92-1	5	mg/kg	196	192	2.26	0% - 20%
		EG005T: Zinc	7440-66-6	5	mg/kg	112	104	7.30	0% - 20%
ES1706190-007	SS02 TCLP LEACHATE	EG005T: Cadmium	7440-43-9	1	mg/kg	<1	<1	0.00	No Limit
		EG005T: Chromium	7440-47-3	2	mg/kg	2	3	0.00	No Limit
		EG005T: Nickel	7440-02-0	2	mg/kg	3	3	0.00	No Limit
		EG005T: Arsenic	7440-38-2	5	mg/kg	<5	<5	0.00	No Limit
		EG005T: Copper	7440-50-8	5	mg/kg	34	12	92.8	No Limit
		EG005T: Lead	7439-92-1	5	mg/kg	21	20	5.78	No Limit
		EG005T: Zinc	7440-66-6	5	mg/kg	80	73	9.15	0% - 50%
EG035T: Total Recoverable Mercury by FIMS (QC Lot: 797416)									
ES1706074-002	Anonymous	EG035T: Mercury	7439-97-6	0.1	mg/kg	0.2	0.2	0.00	No Limit
ES1706190-007	SS02 TCLP LEACHATE	EG035T: Mercury	7439-97-6	0.1	mg/kg	<0.1	<0.1	0.00	No Limit
EP004: Organic Matter (QC Lot: 799164)									
ES1706078-003	Anonymous	EP004: Total Organic Carbon	----	0.5	%	8.6	8.5	0.00	0% - 50%
EW1701090-001	Anonymous	EP004: Total Organic Carbon	----	0.5	%	<0.5	<0.5	0.00	No Limit
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons (QC Lot: 795201)									
ES1706085-001	Anonymous	EP075(SIM): Naphthalene	91-20-3	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP075(SIM): Acenaphthylene	208-96-8	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP075(SIM): Acenaphthene	83-32-9	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP075(SIM): Fluorene	86-73-7	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP075(SIM): Phenanthrene	85-01-8	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP075(SIM): Anthracene	120-12-7	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP075(SIM): Fluoranthene	206-44-0	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP075(SIM): Pyrene	129-00-0	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP075(SIM): Benz(a)anthracene	56-55-3	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP075(SIM): Chrysene	218-01-9	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP075(SIM): Benzo(b+j)fluoranthene	205-99-2 205-82-3	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP075(SIM): Benzo(k)fluoranthene	207-08-9	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP075(SIM): Benzo(a)pyrene	50-32-8	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP075(SIM): Indeno(1.2.3.cd)pyrene	193-39-5	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP075(SIM): Dibenz(a.h)anthracene	53-70-3	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP075(SIM): Benzo(g.h.i)perylene	191-24-2	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP075(SIM): Sum of polycyclic aromatic hydrocarbons	----	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP075(SIM): Benzo(a)pyrene TEQ (zero)	----	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
ES1706213-002	Anonymous	EP075(SIM): Naphthalene	91-20-3	0.5	mg/kg	<0.5	<0.5	0.00	No Limit

Sub-Matrix: **SOIL**

				Laboratory Duplicate (DUP) Report					
Laboratory sample ID	*Client sample ID*	*Method: Compound*	*CAS Number*	*LOR*	*Unit*	*Original Result*	*Duplicate Result*	*RPD (%)*	*Recovery Limits (%)*
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons (QC Lot: 795201) - continued									
ES1706213-002	Anonymous	EP075(SIM): Acenaphthylene	208-96-8	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP075(SIM): Acenaphthene	83-32-9	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP075(SIM): Fluorene	86-73-7	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP075(SIM): Phenanthrene	85-01-8	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP075(SIM): Anthracene	120-12-7	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP075(SIM): Fluoranthene	206-44-0	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP075(SIM): Pyrene	129-00-0	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP075(SIM): Benz(a)anthracene	56-55-3	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP075(SIM): Chrysene	218-01-9	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP075(SIM): Benzo(b+j)fluoranthene	205-99-2 205-82-3	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP075(SIM): Benzo(k)fluoranthene	207-08-9	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP075(SIM): Benzo(a)pyrene	50-32-8	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP075(SIM): Indeno(1.2.3.cd)pyrene	193-39-5	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP075(SIM): Dibenz(a.h)anthracene	53-70-3	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP075(SIM): Benzo(g.h.i)perylene	191-24-2	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP075(SIM): Sum of polycyclic aromatic hydrocarbons	----	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP075(SIM): Benzo(a)pyrene TEQ (zero)	----	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
EP080/071: Total Petroleum Hydrocarbons (QC Lot: 795202)									
ES1706085-001	Anonymous	EP071: C15 - C28 Fraction	----	100	mg/kg	<100	<100	0.00	No Limit
		EP071: C29 - C36 Fraction	----	100	mg/kg	<100	<100	0.00	No Limit
		EP071: C10 - C14 Fraction	----	50	mg/kg	<50	<50	0.00	No Limit
ES1706213-002	Anonymous	EP071: C15 - C28 Fraction	----	100	mg/kg	200	160	23.8	No Limit
		EP071: C29 - C36 Fraction	----	100	mg/kg	220	200	10.0	No Limit
		EP071: C10 - C14 Fraction	----	50	mg/kg	<50	<50	0.00	No Limit
EP080/071: Total Petroleum Hydrocarbons (QC Lot: 796282)									
ES1706190-006	SS01 TCLP LEACHATE	EP080: C6 - C9 Fraction	----	10	mg/kg	<10	<10	0.00	No Limit
ES1706213-009	Anonymous	EP080: C6 - C9 Fraction	----	10	mg/kg	<10	<10	0.00	No Limit
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions (QC Lot: 795202)									
ES1706085-001	Anonymous	EP071: >C16 - C34 Fraction	----	100	mg/kg	<100	<100	0.00	No Limit
		EP071: >C34 - C40 Fraction	----	100	mg/kg	<100	<100	0.00	No Limit
		EP071: >C10 - C16 Fraction	----	50	mg/kg	<50	<50	0.00	No Limit
ES1706213-002	Anonymous	EP071: >C16 - C34 Fraction	----	100	mg/kg	340	300	12.4	No Limit
		EP071: >C34 - C40 Fraction	----	100	mg/kg	140	110	19.6	No Limit
		EP071: >C10 - C16 Fraction	----	50	mg/kg	<50	<50	0.00	No Limit
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions (QC Lot: 796282)									
ES1706190-006	SS01 TCLP LEACHATE	EP080: C6 - C10 Fraction	C6_C10	10	mg/kg	<10	<10	0.00	No Limit
ES1706213-009	Anonymous	EP080: C6 - C10 Fraction	C6_C10	10	mg/kg	<10	<10	0.00	No Limit

Sub-Matrix: **SOIL**

				Laboratory Duplicate (DUP) Report					
Laboratory sample ID	*Client sample ID*	*Method: Compound*	*CAS Number*	*LOR*	*Unit*	*Original Result*	*Duplicate Result*	*RPD (%)*	*Recovery Limits (%)*
EP080: BTEXN (QC Lot: 796282)									
ES1706190-006	SS01 TCLP LEACHATE	EP080: Benzene	71-43-2	0.2	mg/kg	<0.2	<0.2	0.00	No Limit
		EP080: Toluene	108-88-3	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP080: Ethylbenzene	100-41-4	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP080: meta- & para-Xylene	108-38-3 106-42-3	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP080: ortho-Xylene	95-47-6	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP080: Naphthalene	91-20-3	1	mg/kg	<1	<1	0.00	No Limit
ES1706213-009	Anonymous	EP080: Benzene	71-43-2	0.2	mg/kg	<0.2	<0.2	0.00	No Limit
		EP080: Toluene	108-88-3	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP080: Ethylbenzene	100-41-4	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP080: meta- & para-Xylene	108-38-3 106-42-3	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP080: ortho-Xylene	95-47-6	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP080: Naphthalene	91-20-3	1	mg/kg	<1	<1	0.00	No Limit
EP231A: Perfluoroalkyl Sulfonic Acids (QC Lot: 796135)									
ES1706190-006	SS01 TCLP LEACHATE	EP231X: Perfluorobutane sulfonic acid (PFBS)	375-73-5	0.0002	mg/kg	<0.0002	<0.0002	0.00	No Limit
		EP231X: Perfluoropentane sulfonic acid (PFPeS)	2706-91-4	0.0002	mg/kg	<0.0002	<0.0002	0.00	No Limit
		EP231X: Perfluorohexane sulfonic acid (PFHxS)	355-46-4	0.0002	mg/kg	0.0004	0.0003	0.00	No Limit
		EP231X: Perfluoroheptane sulfonic acid (PFHpS)	375-92-8	0.0002	mg/kg	<0.0002	<0.0002	0.00	No Limit
		EP231X: Perfluorooctane sulfonic acid (PFOS)	1763-23-1	0.0002	mg/kg	0.0018	0.0016	7.55	No Limit
		EP231X: Perfluorodecane sulfonic acid (PFDS)	335-77-3	0.0002	mg/kg	<0.0002	<0.0002	0.00	No Limit
EP231B: Perfluoroalkyl Carboxylic Acids (QC Lot: 796135)									
ES1706190-006	SS01 TCLP LEACHATE	EP231X: Perfluoropentanoic acid (PFPeA)	2706-90-3	0.0002	mg/kg	<0.0002	<0.0002	0.00	No Limit
		EP231X: Perfluorohexanoic acid (PFHxA)	307-24-4	0.0002	mg/kg	<0.0002	<0.0002	0.00	No Limit
		EP231X: Perfluoroheptanoic acid (PFHpA)	375-85-9	0.0002	mg/kg	<0.0002	<0.0002	0.00	No Limit
		EP231X: Perfluorooctanoic acid (PFOA)	335-67-1	0.0002	mg/kg	0.0003	0.0002	0.00	No Limit
		EP231X: Perfluorononanoic acid (PFNA)	375-95-1	0.0002	mg/kg	<0.0002	<0.0002	0.00	No Limit
		EP231X: Perfluorodecanoic acid (PFDA)	335-76-2	0.0002	mg/kg	0.0005	0.0004	34.9	No Limit
		EP231X: Perfluoroundecanoic acid (PFUnDA)	2058-94-8	0.0002	mg/kg	<0.0002	<0.0002	0.00	No Limit
		EP231X: Perfluorododecanoic acid (PFDoDA)	307-55-1	0.0002	mg/kg	0.0012	0.0013	0.00	No Limit
		EP231X: Perfluorotridecanoic acid (PFTrDA)	72629-94-8	0.0002	mg/kg	<0.0002	<0.0002	0.00	No Limit
		EP231X: Perfluorotetradecanoic acid (PFTeDA)	376-06-7	0.0005	mg/kg	<0.0005	<0.0005	0.00	No Limit
		EP231X: Perfluorobutanoic acid (PFBA)	375-22-4	0.001	mg/kg	<0.001	<0.001	0.00	No Limit
EP231C: Perfluoroalkyl Sulfonamides (QC Lot: 796135)									
ES1706190-006	SS01 TCLP LEACHATE	EP231X: Perfluorooctane sulfonamide (FOSA)	754-91-6	0.0002	mg/kg	<0.0002	<0.0002	0.00	No Limit
		EP231X: N-Methyl perfluorooctane sulfonamidoacetic acid (MeFOSAA)	2355-31-9	0.0002	mg/kg	<0.0002	<0.0002	0.00	No Limit
		EP231X: N-Ethyl perfluorooctane sulfonamidoacetic acid (EtFOSAA)	2991-50-6	0.0002	mg/kg	<0.0002	<0.0002	0.00	No Limit

Sub-Matrix: **SOIL**

Laboratory sample ID	Client sample ID	Method: Compound	CAS Number	Laboratory Duplicate (DUP) Report					
				LOR	Unit	Original Result	Duplicate Result	RPD (%)	Recovery Limits (%)
EP231C: Perfluoroalkyl Sulfonamides (QC Lot: 796135) - continued									
ES1706190-006	SS01 TCLP LEACHATE	EP231X: N-Methyl perfluorooctane sulfonamide (MeFOSA)	31506-32-8	0.0005	mg/kg	<0.0005	<0.0005	0.00	No Limit
		EP231X: N-Ethyl perfluorooctane sulfonamide (EtFOSA)	4151-50-2	0.0005	mg/kg	<0.0005	<0.0005	0.00	No Limit
		EP231X: N-Methyl perfluorooctane sulfonamidoethanol (MeFOSE)	2448-09-7	0.0005	mg/kg	<0.0005	<0.0005	0.00	No Limit
		EP231X: N-Ethyl perfluorooctane sulfonamidoethanol (EtFOSE)	1691-99-2	0.0005	mg/kg	<0.0005	<0.0005	0.00	No Limit
EP231D: (n:2) Fluorotelomer Sulfonic Acids (QC Lot: 796135)									
ES1706190-006	SS01 TCLP LEACHATE	EP231X: 4:2 Fluorotelomer sulfonic acid (4:2 FTS)	757124-72-4	0.0005	mg/kg	<0.0005	<0.0005	0.00	No Limit
		EP231X: 6:2 Fluorotelomer sulfonic acid (6:2 FTS)	27619-97-2	0.0005	mg/kg	<0.0005	<0.0005	0.00	No Limit
		EP231X: 8:2 Fluorotelomer sulfonic acid (8:2 FTS)	39108-34-4	0.0005	mg/kg	<0.0005	<0.0005	0.00	No Limit
		EP231X: 10:2 Fluorotelomer sulfonic acid (10:2 FTS)	120226-60-0	0.0005	mg/kg	<0.0005	<0.0005	0.00	No Limit

Sub-Matrix: **WATER**

Laboratory sample ID	Client sample ID	Method: Compound	CAS Number	Laboratory Duplicate (DUP) Report					
				LOR	Unit	Original Result	Duplicate Result	RPD (%)	Recovery Limits (%)
EA005P: pH by PC Titrator (QC Lot: 795466)									
ES1706186-001	Anonymous	EA005-P: pH Value	----	0.01	pH Unit	7.36	7.31	0.682	0% - 20%
ES1706191-003	Anonymous	EA005-P: pH Value	----	0.01	pH Unit	7.57	7.58	0.132	0% - 20%
EA015: Total Dissolved Solids dried at 180 ± 5 °C (QC Lot: 796824)									
ES1706081-001	Anonymous	EA015H: Total Dissolved Solids @180°C	----	10	mg/L	246	222	10.0	0% - 20%
ES1706230-002	Anonymous	EA015H: Total Dissolved Solids @180°C	----	10	mg/L	56	33	51.3	No Limit
ED037P: Alkalinity by PC Titrator (QC Lot: 795465)									
ES1705966-001	Anonymous	ED037-P: Hydroxide Alkalinity as CaCO3	DMO-210-001	1	mg/L	<1	<1	0.00	No Limit
		ED037-P: Carbonate Alkalinity as CaCO3	3812-32-6	1	mg/L	<1	<1	0.00	No Limit
		ED037-P: Bicarbonate Alkalinity as CaCO3	71-52-3	1	mg/L	51	49	3.13	0% - 20%
		ED037-P: Total Alkalinity as CaCO3	----	1	mg/L	51	49	3.13	0% - 20%
ES1706186-001	Anonymous	ED037-P: Hydroxide Alkalinity as CaCO3	DMO-210-001	1	mg/L	<1	<1	0.00	No Limit
		ED037-P: Carbonate Alkalinity as CaCO3	3812-32-6	1	mg/L	<1	<1	0.00	No Limit
		ED037-P: Bicarbonate Alkalinity as CaCO3	71-52-3	1	mg/L	29	29	0.00	0% - 20%
		ED037-P: Total Alkalinity as CaCO3	----	1	mg/L	29	29	0.00	0% - 20%
ED041G: Sulfate (Turbidimetric) as SO4 2- by DA (QC Lot: 794960)									
ES1706139-001	Anonymous	ED041G: Sulfate as SO4 - Turbidimetric	14808-79-8	1	mg/L	101	99	2.74	0% - 20%
ME1700348-006	Anonymous	ED041G: Sulfate as SO4 - Turbidimetric	14808-79-8	1	mg/L	328	332	1.33	0% - 20%
ED045G: Chloride by Discrete Analyser (QC Lot: 794958)									
ES1705907-002	Anonymous	ED045G: Chloride	16887-00-6	1	mg/L	188	186	0.806	0% - 20%

Sub-Matrix: **WATER**

				Laboratory Duplicate (DUP) Report					
Laboratory sample ID	*Client sample ID*	*Method: Compound*	*CAS Number*	*LOR*	*Unit*	*Original Result*	*Duplicate Result*	*RPD (%)*	*Recovery Limits (%)*
ED045G: Chloride by Discrete Analyser (QC Lot: 794958) - continued									
ES1706050-014	Anonymous	ED045G: Chloride	16887-00-6	1	mg/L	124	123	1.19	0% - 20%
ED093F: Dissolved Major Cations (QC Lot: 796247)									
ES1705907-014	Anonymous	ED093F: Calcium	7440-70-2	1	mg/L	26	26	0.00	0% - 20%
		ED093F: Magnesium	7439-95-4	1	mg/L	18	18	0.00	0% - 50%
		ED093F: Sodium	7440-23-5	1	mg/L	199	199	0.00	0% - 20%
		ED093F: Potassium	7440-09-7	1	mg/L	21	21	0.00	0% - 20%
ES1706111-001	Anonymous	ED093F: Calcium	7440-70-2	1	mg/L	2	2	0.00	No Limit
		ED093F: Magnesium	7439-95-4	1	mg/L	<1	<1	0.00	No Limit
		ED093F: Sodium	7440-23-5	1	mg/L	6	6	0.00	No Limit
		ED093F: Potassium	7440-09-7	1	mg/L	<1	<1	0.00	No Limit
ED093F: Dissolved Major Cations (QC Lot: 799292)									
ES1706190-001	SW01	ED093F: Calcium	7440-70-2	1	mg/L	26	25	0.00	0% - 20%
		ED093F: Magnesium	7439-95-4	1	mg/L	4	4	0.00	No Limit
		ED093F: Sodium	7440-23-5	1	mg/L	21	20	0.00	0% - 20%
		ED093F: Potassium	7440-09-7	1	mg/L	12	12	0.00	0% - 50%
EG020F: Dissolved Metals by ICP-MS (QC Lot: 799294)									
ES1706220-006	Anonymous	EG020A-F: Cadmium	7440-43-9	0.0001	mg/L	<0.0001	<0.0001	0.00	No Limit
		EG020A-F: Arsenic	7440-38-2	0.001	mg/L	0.015	0.015	0.00	0% - 50%
		EG020A-F: Chromium	7440-47-3	0.001	mg/L	<0.001	<0.001	0.00	No Limit
		EG020A-F: Copper	7440-50-8	0.001	mg/L	<0.001	<0.001	0.00	No Limit
		EG020A-F: Lead	7439-92-1	0.001	mg/L	<0.001	<0.001	0.00	No Limit
		EG020A-F: Nickel	7440-02-0	0.001	mg/L	0.003	0.003	0.00	No Limit
		EG020A-F: Zinc	7440-66-6	0.005	mg/L	<0.005	<0.005	0.00	No Limit
ES1706190-001	SW01	EG020A-F: Cadmium	7440-43-9	0.0001	mg/L	<0.0001	<0.0001	0.00	No Limit
		EG020A-F: Arsenic	7440-38-2	0.001	mg/L	0.003	0.002	0.00	No Limit
		EG020A-F: Chromium	7440-47-3	0.001	mg/L	0.002	0.002	0.00	No Limit
		EG020A-F: Copper	7440-50-8	0.001	mg/L	0.006	0.007	0.00	No Limit
		EG020A-F: Lead	7439-92-1	0.001	mg/L	<0.001	<0.001	0.00	No Limit
		EG020A-F: Nickel	7440-02-0	0.001	mg/L	0.001	0.001	0.00	No Limit
		EG020A-F: Zinc	7440-66-6	0.005	mg/L	0.016	0.014	8.18	No Limit
EG020T: Total Metals by ICP-MS (QC Lot: 799267)									
ES1706112-001	Anonymous	EG020A-T: Cadmium	7440-43-9	0.0001	mg/L	<0.0001	<0.0001	0.00	No Limit
		EG020A-T: Arsenic	7440-38-2	0.001	mg/L	0.002	0.002	0.00	No Limit
		EG020A-T: Chromium	7440-47-3	0.001	mg/L	<0.001	<0.001	0.00	No Limit
		EG020A-T: Copper	7440-50-8	0.001	mg/L	0.003	0.004	0.00	No Limit
		EG020A-T: Lead	7439-92-1	0.001	mg/L	0.001	0.001	0.00	No Limit
		EG020A-T: Nickel	7440-02-0	0.001	mg/L	0.003	0.004	0.00	No Limit
		EG020A-T: Zinc	7440-66-6	0.005	mg/L	0.008	0.008	0.00	No Limit
ES1706201-002	Anonymous	EG020A-T: Cadmium	7440-43-9	0.0001	mg/L	<0.0001	<0.0001	0.00	No Limit

Sub-Matrix: **WATER**

Laboratory sample ID	Client sample ID	Method: Compound	CAS Number	Laboratory Duplicate (DUP) Report					
				LOR	Unit	Original Result	Duplicate Result	RPD (%)	Recovery Limits (%)
EG020T: Total Metals by ICP-MS (QC Lot: 799267) - continued									
ES1706201-002	Anonymous	EG020A-T: Arsenic	7440-38-2	0.001	mg/L	<0.001	<0.001	0.00	No Limit
		EG020A-T: Chromium	7440-47-3	0.001	mg/L	<0.001	<0.001	0.00	No Limit
		EG020A-T: Copper	7440-50-8	0.001	mg/L	0.001	<0.001	0.00	No Limit
		EG020A-T: Lead	7439-92-1	0.001	mg/L	<0.001	<0.001	0.00	No Limit
		EG020A-T: Nickel	7440-02-0	0.001	mg/L	0.001	<0.001	0.00	No Limit
		EG020A-T: Zinc	7440-66-6	0.005	mg/L	<0.005	<0.005	0.00	No Limit
EG035F: Dissolved Mercury by FIMS (QC Lot: 799293)									
ES1706089-002	Anonymous	EG035F: Mercury	7439-97-6	0.0001	mg/L	<0.0001	<0.0001	0.00	No Limit
ME1700366-001	Anonymous	EG035F: Mercury	7439-97-6	0.0001	mg/L	<0.0001	<0.0001	0.00	No Limit
EG035T: Total Recoverable Mercury by FIMS (QC Lot: 799952)									
ES1706186-001	Anonymous	EG035T: Mercury	7439-97-6	0.0001	mg/L	<0.0001	<0.0001	0.00	No Limit
ES1706261-002	Anonymous	EG035T: Mercury	7439-97-6	0.0001	mg/L	<0.0001	<0.0001	0.00	No Limit
EP005: Total Organic Carbon (TOC) (QC Lot: 794952)									
ES1705667-001	Anonymous	EP005: Total Organic Carbon	----	1	mg/L	198	190	3.97	0% - 20%
EW1700815-006	Anonymous	EP005: Total Organic Carbon	----	1	mg/L	4	4	0.00	No Limit
EP005: Total Organic Carbon (TOC) (QC Lot: 799316)									
ES1706112-003	Anonymous	EP005: Total Organic Carbon	----	1	mg/L	7	7	0.00	No Limit
ES1706298-001	Anonymous	EP005: Total Organic Carbon	----	1	mg/L	38	37	3.61	0% - 20%
EP080/071: Total Petroleum Hydrocarbons (QC Lot: 795350)									
EB1704939-001	Anonymous	EP080: C6 - C9 Fraction	----	20	µg/L	<20	<20	0.00	No Limit
ES1706190-001	SW01	EP080: C6 - C9 Fraction	----	20	µg/L	<20	<20	0.00	No Limit
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions (QC Lot: 795350)									
EB1704939-001	Anonymous	EP080: C6 - C10 Fraction	C6_C10	20	µg/L	<20	<20	0.00	No Limit
ES1706190-001	SW01	EP080: C6 - C10 Fraction	C6_C10	20	µg/L	<20	<20	0.00	No Limit
EP080: BTEXN (QC Lot: 795350)									
EB1704939-001	Anonymous	EP080: Benzene	71-43-2	1	µg/L	<1	<1	0.00	No Limit
		EP080: Toluene	108-88-3	2	µg/L	<2	<2	0.00	No Limit
		EP080: Ethylbenzene	100-41-4	2	µg/L	<2	<2	0.00	No Limit
		EP080: meta- & para-Xylene	108-38-3 106-42-3	2	µg/L	<2	<2	0.00	No Limit
		EP080: ortho-Xylene	95-47-6	2	µg/L	<2	<2	0.00	No Limit
		EP080: Naphthalene	91-20-3	5	µg/L	<5	<5	0.00	No Limit
ES1706190-001	SW01	EP080: Benzene	71-43-2	1	µg/L	<1	<1	0.00	No Limit
		EP080: Toluene	108-88-3	2	µg/L	<2	<2	0.00	No Limit
		EP080: Ethylbenzene	100-41-4	2	µg/L	<2	<2	0.00	No Limit
		EP080: meta- & para-Xylene	108-38-3 106-42-3	2	µg/L	<2	<2	0.00	No Limit
		EP080: ortho-Xylene	95-47-6	2	µg/L	<2	<2	0.00	No Limit
		EP080: Naphthalene	91-20-3	5	µg/L	<5	<5	0.00	No Limit

Sub-Matrix: **WATER**

				Laboratory Duplicate (DUP) Report					
Laboratory sample ID	*Client sample ID*	*Method: Compound*	*CAS Number*	*LOR*	*Unit*	*Original Result*	*Duplicate Result*	*RPD (%)*	*Recovery Limits (%)*
EP231A: Perfluoroalkyl Sulfonic Acids (QC Lot: 796142)									
EP1702379-001	Anonymous	EP231X: Perfluorooctane sulfonic acid (PFOS)	1763-23-1	0.01	µg/L	0.18	0.18	0.00	0% - 50%
		EP231X: Perfluorobutane sulfonic acid (PFBS)	375-73-5	0.02	µg/L	0.06	0.06	0.00	No Limit
		EP231X: Perfluoropentane sulfonic acid (PFPeS)	2706-91-4	0.02	µg/L	0.07	0.07	0.00	No Limit
		EP231X: Perfluorohexane sulfonic acid (PFHxS)	355-46-4	0.02	µg/L	0.44	0.41	6.88	0% - 20%
		EP231X: Perfluoroheptane sulfonic acid (PFHpS)	375-92-8	0.02	µg/L	<0.02	<0.02	0.00	No Limit
		EP231X: Perfluorodecane sulfonic acid (PFDS)	335-77-3	0.02	µg/L	<0.02	<0.02	0.00	No Limit
ES1706190-002	SW02	EP231X: Perfluorooctane sulfonic acid (PFOS)	1763-23-1	0.01	µg/L	0.07	0.08	0.00	No Limit
		EP231X: Perfluorobutane sulfonic acid (PFBS)	375-73-5	0.02	µg/L	<0.02	<0.02	0.00	No Limit
		EP231X: Perfluoropentane sulfonic acid (PFPeS)	2706-91-4	0.02	µg/L	<0.02	<0.02	0.00	No Limit
		EP231X: Perfluorohexane sulfonic acid (PFHxS)	355-46-4	0.02	µg/L	0.03	0.03	0.00	No Limit
		EP231X: Perfluoroheptane sulfonic acid (PFHpS)	375-92-8	0.02	µg/L	<0.02	<0.02	0.00	No Limit
		EP231X: Perfluorodecane sulfonic acid (PFDS)	335-77-3	0.02	µg/L	<0.02	<0.02	0.00	No Limit
EP231A: Perfluoroalkyl Sulfonic Acids (QC Lot: 798140)									
ES1706190-006	SS01 TCLP LEACHATE	EP231X: Perfluorooctane sulfonic acid (PFOS)	1763-23-1	0.01	µg/L	0.03	0.03	0.00	No Limit
		EP231X: Perfluorobutane sulfonic acid (PFBS)	375-73-5	0.02	µg/L	<0.02	<0.02	0.00	No Limit
		EP231X: Perfluoropentane sulfonic acid (PFPeS)	2706-91-4	0.02	µg/L	<0.02	<0.02	0.00	No Limit
		EP231X: Perfluorohexane sulfonic acid (PFHxS)	355-46-4	0.02	µg/L	<0.02	<0.02	0.00	No Limit
		EP231X: Perfluoroheptane sulfonic acid (PFHpS)	375-92-8	0.02	µg/L	<0.02	<0.02	0.00	No Limit
		EP231X: Perfluorodecane sulfonic acid (PFDS)	335-77-3	0.02	µg/L	<0.02	<0.02	0.00	No Limit
EP231B: Perfluoroalkyl Carboxylic Acids (QC Lot: 796142)									
EP1702379-001	Anonymous	EP231X: Perfluorooctanoic acid (PFOA)	335-67-1	0.01	µg/L	0.04	0.05	0.00	No Limit
		EP231X: Perfluoropentanoic acid (PFPeA)	2706-90-3	0.02	µg/L	0.03	0.03	0.00	No Limit
		EP231X: Perfluorohexanoic acid (PFHxA)	307-24-4	0.02	µg/L	0.20	0.20	0.00	0% - 50%
		EP231X: Perfluoroheptanoic acid (PFHpA)	375-85-9	0.02	µg/L	0.03	0.03	0.00	No Limit
		EP231X: Perfluorononanoic acid (PFNA)	375-95-1	0.02	µg/L	<0.02	<0.02	0.00	No Limit
		EP231X: Perfluorodecanoic acid (PFDA)	335-76-2	0.02	µg/L	<0.02	<0.02	0.00	No Limit
		EP231X: Perfluoroundecanoic acid (PFUnDA)	2058-94-8	0.02	µg/L	<0.02	<0.02	0.00	No Limit
		EP231X: Perfluorododecanoic acid (PFDoDA)	307-55-1	0.02	µg/L	<0.02	<0.02	0.00	No Limit
		EP231X: Perfluorotridecanoic acid (PFTrDA)	72629-94-8	0.02	µg/L	<0.02	<0.02	0.00	No Limit
		EP231X: Perfluorotetradecanoic acid (PFTeDA)	376-06-7	0.05	µg/L	<0.05	<0.05	0.00	No Limit
		EP231X: Perfluorobutanoic acid (PFBA)	375-22-4	0.1	µg/L	<0.1	<0.1	0.00	No Limit
ES1706190-002	SW02	EP231X: Perfluorooctanoic acid (PFOA)	335-67-1	0.01	µg/L	0.02	0.03	0.00	No Limit
		EP231X: Perfluoropentanoic acid (PFPeA)	2706-90-3	0.02	µg/L	<0.02	<0.02	0.00	No Limit
		EP231X: Perfluorohexanoic acid (PFHxA)	307-24-4	0.02	µg/L	<0.02	<0.02	0.00	No Limit
		EP231X: Perfluoroheptanoic acid (PFHpA)	375-85-9	0.02	µg/L	<0.02	<0.02	0.00	No Limit
		EP231X: Perfluorononanoic acid (PFNA)	375-95-1	0.02	µg/L	<0.02	<0.02	0.00	No Limit
		EP231X: Perfluorodecanoic acid (PFDA)	335-76-2	0.02	µg/L	<0.02	<0.02	0.00	No Limit
		EP231X: Perfluoroundecanoic acid (PFUnDA)	2058-94-8	0.02	µg/L	<0.02	<0.02	0.00	No Limit
		EP231X: Perfluorododecanoic acid (PFDoDA)	307-55-1	0.02	µg/L	<0.02	<0.02	0.00	No Limit
		EP231X: Perfluorotridecanoic acid (PFTrDA)	72629-94-8	0.02	µg/L	<0.02	<0.02	0.00	No Limit

Sub-Matrix: **WATER**

				Laboratory Duplicate (DUP) Report					
Laboratory sample ID	*Client sample ID*	*Method: Compound*	*CAS Number*	*LOR*	*Unit*	*Original Result*	*Duplicate Result*	*RPD (%)*	*Recovery Limits (%)*
EP231B: Perfluoroalkyl Carboxylic Acids (QC Lot: 796142) - continued									
ES1706190-002	SW02	EP231X: Perfluorotetradecanoic acid (PFTeDA)	376-06-7	0.05	µg/L	<0.05	<0.05	0.00	No Limit
		EP231X: Perfluorobutanoic acid (PFBA)	375-22-4	0.1	µg/L	<0.1	<0.1	0.00	No Limit
EP231B: Perfluoroalkyl Carboxylic Acids (QC Lot: 798140)									
ES1706190-006	SS01 TCLP LEACHATE	EP231X: Perfluorooctanoic acid (PFOA)	335-67-1	0.01	µg/L	<0.01	<0.01	0.00	No Limit
		EP231X: Perfluoropentanoic acid (PFPeA)	2706-90-3	0.02	µg/L	<0.02	<0.02	0.00	No Limit
		EP231X: Perfluorohexanoic acid (PFHxA)	307-24-4	0.02	µg/L	<0.02	<0.02	0.00	No Limit
		EP231X: Perfluoroheptanoic acid (PFHpA)	375-85-9	0.02	µg/L	<0.02	<0.02	0.00	No Limit
		EP231X: Perfluorononanoic acid (PFNA)	375-95-1	0.02	µg/L	<0.02	<0.02	0.00	No Limit
		EP231X: Perfluorodecanoic acid (PFDA)	335-76-2	0.02	µg/L	<0.02	<0.02	0.00	No Limit
		EP231X: Perfluoroundecanoic acid (PFUnDA)	2058-94-8	0.02	µg/L	<0.02	<0.02	0.00	No Limit
		EP231X: Perfluorododecanoic acid (PFDoDA)	307-55-1	0.02	µg/L	<0.02	<0.02	0.00	No Limit
		EP231X: Perfluorotridecanoic acid (PFTrDA)	72629-94-8	0.02	µg/L	<0.02	<0.02	0.00	No Limit
		EP231X: Perfluorotetradecanoic acid (PFTeDA)	376-06-7	0.05	µg/L	<0.05	<0.05	0.00	No Limit
		EP231X: Perfluorobutanoic acid (PFBA)	375-22-4	0.1	µg/L	<0.1	<0.1	0.00	No Limit
EP231C: Perfluoroalkyl Sulfonamides (QC Lot: 796142)									
EP1702379-001	Anonymous	EP231X: Perfluorooctane sulfonamide (FOSA)	754-91-6	0.02	µg/L	<0.02	<0.02	0.00	No Limit
		EP231X: N-Methyl perfluorooctane sulfonamidoacetic acid (MeFOSAA)	2355-31-9	0.02	µg/L	<0.02	<0.02	0.00	No Limit
		EP231X: N-Ethyl perfluorooctane sulfonamidoacetic acid (EtFOSAA)	2991-50-6	0.02	µg/L	<0.02	<0.02	0.00	No Limit
		EP231X: N-Methyl perfluorooctane sulfonamide (MeFOSA)	31506-32-8	0.05	µg/L	<0.05	<0.05	0.00	No Limit
		EP231X: N-Ethyl perfluorooctane sulfonamide (EtFOSA)	4151-50-2	0.05	µg/L	<0.05	<0.05	0.00	No Limit
		EP231X: N-Methyl perfluorooctane sulfonamidoethanol (MeFOSE)	2448-09-7	0.05	µg/L	<0.05	<0.05	0.00	No Limit
		EP231X: N-Ethyl perfluorooctane sulfonamidoethanol (EtFOSE)	1691-99-2	0.05	µg/L	<0.05	<0.05	0.00	No Limit
ES1706190-002	SW02	EP231X: Perfluorooctane sulfonamide (FOSA)	754-91-6	0.02	µg/L	<0.02	<0.02	0.00	No Limit
		EP231X: N-Methyl perfluorooctane sulfonamidoacetic acid (MeFOSAA)	2355-31-9	0.02	µg/L	<0.02	<0.02	0.00	No Limit
		EP231X: N-Ethyl perfluorooctane sulfonamidoacetic acid (EtFOSAA)	2991-50-6	0.02	µg/L	<0.02	<0.02	0.00	No Limit
		EP231X: N-Methyl perfluorooctane sulfonamide (MeFOSA)	31506-32-8	0.05	µg/L	<0.05	<0.05	0.00	No Limit
		EP231X: N-Ethyl perfluorooctane sulfonamide (EtFOSA)	4151-50-2	0.05	µg/L	<0.05	<0.05	0.00	No Limit
		EP231X: N-Methyl perfluorooctane sulfonamidoethanol (MeFOSE)	2448-09-7	0.05	µg/L	<0.05	<0.05	0.00	No Limit
		EP231X: N-Ethyl perfluorooctane sulfonamidoethanol (EtFOSE)	1691-99-2	0.05	µg/L	<0.05	<0.05	0.00	No Limit

Sub-Matrix: **WATER**

				Laboratory Duplicate (DUP) Report					
Laboratory sample ID	*Client sample ID*	*Method: Compound*	*CAS Number*	*LOR*	*Unit*	*Original Result*	*Duplicate Result*	*RPD (%)*	*Recovery Limits (%)*
EP231C: Perfluoroalkyl Sulfonamides (QC Lot: 798140)									
ES1706190-006	SS01 TCLP LEACHATE	EP231X: Perfluorooctane sulfonamide (FOSA)	754-91-6	0.02	µg/L	<0.02	<0.02	0.00	No Limit
		EP231X: N-Methyl perfluorooctane sulfonamidoacetic acid (MeFOSAA)	2355-31-9	0.02	µg/L	<0.02	<0.02	0.00	No Limit
		EP231X: N-Ethyl perfluorooctane sulfonamidoacetic acid (EtFOSAA)	2991-50-6	0.02	µg/L	<0.02	<0.02	0.00	No Limit
		EP231X: N-Methyl perfluorooctane sulfonamide (MeFOSA)	31506-32-8	0.05	µg/L	<0.05	<0.05	0.00	No Limit
		EP231X: N-Ethyl perfluorooctane sulfonamide (EtFOSA)	4151-50-2	0.05	µg/L	<0.05	<0.05	0.00	No Limit
		EP231X: N-Methyl perfluorooctane sulfonamidoethanol (MeFOSE)	2448-09-7	0.05	µg/L	<0.05	<0.05	0.00	No Limit
		EP231X: N-Ethyl perfluorooctane sulfonamidoethanol (EtFOSE)	1691-99-2	0.05	µg/L	<0.05	<0.05	0.00	No Limit
EP231D: (n:2) Fluorotelomer Sulfonic Acids (QC Lot: 796142)									
EP1702379-001	Anonymous	EP231X: 4:2 Fluorotelomer sulfonic acid (4:2 FTS)	757124-72-4	0.05	µg/L	<0.05	<0.05	0.00	No Limit
		EP231X: 6:2 Fluorotelomer sulfonic acid (6:2 FTS)	27619-97-2	0.05	µg/L	<0.05	<0.05	0.00	No Limit
		EP231X: 8:2 Fluorotelomer sulfonic acid (8:2 FTS)	39108-34-4	0.05	µg/L	<0.05	<0.05	0.00	No Limit
		EP231X: 10:2 Fluorotelomer sulfonic acid (10:2 FTS)	120226-60-0	0.05	µg/L	<0.05	<0.05	0.00	No Limit
ES1706190-002	SW02	EP231X: 4:2 Fluorotelomer sulfonic acid (4:2 FTS)	757124-72-4	0.05	µg/L	<0.05	<0.05	0.00	No Limit
		EP231X: 6:2 Fluorotelomer sulfonic acid (6:2 FTS)	27619-97-2	0.05	µg/L	<0.05	<0.05	0.00	No Limit
		EP231X: 8:2 Fluorotelomer sulfonic acid (8:2 FTS)	39108-34-4	0.05	µg/L	<0.05	<0.05	0.00	No Limit
		EP231X: 10:2 Fluorotelomer sulfonic acid (10:2 FTS)	120226-60-0	0.05	µg/L	<0.05	<0.05	0.00	No Limit
EP231D: (n:2) Fluorotelomer Sulfonic Acids (QC Lot: 798140)									
ES1706190-006	SS01 TCLP LEACHATE	EP231X: 4:2 Fluorotelomer sulfonic acid (4:2 FTS)	757124-72-4	0.05	µg/L	<0.05	<0.05	0.00	No Limit
		EP231X: 6:2 Fluorotelomer sulfonic acid (6:2 FTS)	27619-97-2	0.05	µg/L	<0.05	<0.05	0.00	No Limit
		EP231X: 8:2 Fluorotelomer sulfonic acid (8:2 FTS)	39108-34-4	0.05	µg/L	<0.05	<0.05	0.00	No Limit
		EP231X: 10:2 Fluorotelomer sulfonic acid (10:2 FTS)	120226-60-0	0.05	µg/L	<0.05	<0.05	0.00	No Limit
EP231P: PFAS Sums (QC Lot: 796142)									
EP1702379-001	Anonymous	EP231X: Sum of PFAS	----	0.01	µg/L	1.05	1.03	1.92	0% - 20%

Sub-Matrix: **WATER**

				Laboratory Duplicate (DUP) Report					
Laboratory sample ID	*Client sample ID*	*Method: Compound*	*CAS Number*	*LOR*	*Unit*	*Original Result*	*Duplicate Result*	*RPD (%)*	*Recovery Limits (%)*
EP231P: PFAS Sums (QC Lot: 796142) - continued									
ES1706190-002	SW02	EP231X: Sum of PFAS	----	0.01	µg/L	0.12	0.14	15.4	0% - 50%
EP231P: PFAS Sums (QC Lot: 798140)									
ES1706190-006	SS01 TCLP LEACHATE	EP231X: Sum of PFAS	----	0.01	µg/L	0.03	0.03	0.00	No Limit

Method Blank (MB) and Laboratory Control Spike (LCS) Report

The quality control term Method / Laboratory Blank refers to an analyte free matrix to which all reagents are added in the same volumes or proportions as used in standard sample preparation. The purpose of this QC parameter is to monitor potential laboratory contamination. The quality control term Laboratory Control Spike (LCS) refers to a certified reference material, or a known interference free matrix spiked with target analytes. The purpose of this QC parameter is to monitor method precision and accuracy independent of sample matrix. Dynamic Recovery Limits are based on statistical evaluation of processed LCS.

Sub-Matrix: **SOIL**

				Method Blank (MB) Report	Laboratory Control Spike (LCS) Report			
					Spike	Spike Recovery (%)	Recovery Limits (%)	
Method: Compound	CAS Number	LOR	Unit	Result	Concentration	LCS	Low	High
ED006: Exchangeable Cations on Alkaline Soils (QCLot: 803331)								
ED006: Exchangeable Calcium	----	0.1	meq/100g	<0.1	2.5 meq/100g	108	80	110
ED006: Exchangeable Magnesium	----	0.1	meq/100g	<0.1	4.17 meq/100g	104	80	110
ED006: Exchangeable Potassium	----	0.1	meq/100g	<0.1	1.28 meq/100g	102	80	110
ED006: Exchangeable Sodium	----	0.1	meq/100g	<0.1	2.17 meq/100g	101	80	110
ED006: Cation Exchange Capacity	----	0.1	meq/100g	<0.1	----	----	----	----
ED040S: Soluble Major Anions (QCLot: 800743)								
ED040S: Sulfate as SO4 2-	14808-79-8	10	mg/kg	<10	150 mg/kg	94.6	80	120
ED045G: Chloride by Discrete Analyser (QCLot: 800744)								
ED045G: Chloride	16887-00-6	10	mg/kg	<10	50 mg/kg	112	75	125
				<10	5000 mg/kg	97.7	79	117
ED093S: Soluble Major Cations (QCLot: 800745)								
ED093S: Calcium	7440-70-2	10	mg/kg	<10	50 mg/kg	96.3	85	119
ED093S: Magnesium	7439-95-4	10	mg/kg	<10	50 mg/kg	97.4	85	119
ED093S: Sodium	7440-23-5	10	mg/kg	<10	50 mg/kg	100	81	123
ED093S: Potassium	7440-09-7	10	mg/kg	<10	50 mg/kg	97.7	83	125
EG005T: Total Metals by ICP-AES (QCLot: 797415)								
EG005T: Arsenic	7440-38-2	5	mg/kg	<5	21.7 mg/kg	99.3	86	126
EG005T: Cadmium	7440-43-9	1	mg/kg	<1	4.64 mg/kg	97.6	83	113
EG005T: Chromium	7440-47-3	2	mg/kg	<2	43.9 mg/kg	98.0	76	128
EG005T: Copper	7440-50-8	5	mg/kg	<5	32 mg/kg	99.5	86	120
EG005T: Lead	7439-92-1	5	mg/kg	<5	40 mg/kg	98.8	80	114
EG005T: Nickel	7440-02-0	2	mg/kg	<2	55 mg/kg	105	87	123
EG005T: Zinc	7440-66-6	5	mg/kg	<5	60.8 mg/kg	107	80	122
EG035T: Total Recoverable Mercury by FIMS (QCLot: 797416)								
EG035T: Mercury	7439-97-6	0.1	mg/kg	<0.1	2.57 mg/kg	78.4	70	105
EN33: TCLP Leach (QCLot: 794841)								
EN33a: Initial pH	----	0.1	pH Unit	1.0	----	----	----	----
EN33a: After HCl pH	----	0.1	pH Unit	1.0	----	----	----	----
EN33a: Final pH	----	0.1	pH Unit	1.0	----	----	----	----
EP004: Organic Matter (QCLot: 799164)								
EP004: Total Organic Carbon	----	0.5	%	<0.5	1.46 %	97.0	81	99
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons (QCLot: 795201)								
EP075(SIM): Naphthalene	91-20-3	0.5	mg/kg	<0.5	6 mg/kg	102	77	125

Sub-Matrix: **SOIL**

Method: Compound	CAS Number	LOR	Unit	Method Blank (MB) Report	Laboratory Control Spike (LCS) Report			
					Spike	Spike Recovery (%)	Recovery Limits (%)	
				Result	Concentration	LCS	Low	High
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons (QCLot: 795201) - continued								
EP075(SIM): Acenaphthylene	208-96-8	0.5	mg/kg	<0.5	6 mg/kg	108	72	124
EP075(SIM): Acenaphthene	83-32-9	0.5	mg/kg	<0.5	6 mg/kg	113	73	127
EP075(SIM): Fluorene	86-73-7	0.5	mg/kg	<0.5	6 mg/kg	107	72	126
EP075(SIM): Phenanthrene	85-01-8	0.5	mg/kg	<0.5	6 mg/kg	104	75	127
EP075(SIM): Anthracene	120-12-7	0.5	mg/kg	<0.5	6 mg/kg	102	77	127
EP075(SIM): Fluoranthene	206-44-0	0.5	mg/kg	<0.5	6 mg/kg	109	73	127
EP075(SIM): Pyrene	129-00-0	0.5	mg/kg	<0.5	6 mg/kg	110	74	128
EP075(SIM): Benz(a)anthracene	56-55-3	0.5	mg/kg	<0.5	6 mg/kg	95.8	69	123
EP075(SIM): Chrysene	218-01-9	0.5	mg/kg	<0.5	6 mg/kg	98.8	75	127
EP075(SIM): Benzo(b+j)fluoranthene	205-99-2 205-82-3	0.5	mg/kg	<0.5	6 mg/kg	94.4	68	116
EP075(SIM): Benzo(k)fluoranthene	207-08-9	0.5	mg/kg	<0.5	6 mg/kg	101	74	126
EP075(SIM): Benzo(a)pyrene	50-32-8	0.5	mg/kg	<0.5	6 mg/kg	99.8	70	126
EP075(SIM): Indeno(1.2.3.cd)pyrene	193-39-5	0.5	mg/kg	<0.5	6 mg/kg	94.5	61	121
EP075(SIM): Dibenz(a.h)anthracene	53-70-3	0.5	mg/kg	<0.5	6 mg/kg	99.0	62	118
EP075(SIM): Benzo(g.h.i)perylene	191-24-2	0.5	mg/kg	<0.5	6 mg/kg	93.2	63	121
EP080/071: Total Petroleum Hydrocarbons (QCLot: 795202)								
EP071: C10 - C14 Fraction	----	50	mg/kg	<50	200 mg/kg	97.5	75	129
EP071: C15 - C28 Fraction	----	100	mg/kg	<100	300 mg/kg	107	77	131
EP071: C29 - C36 Fraction	----	100	mg/kg	<100	200 mg/kg	103	71	129
EP080/071: Total Petroleum Hydrocarbons (QCLot: 796282)								
EP080: C6 - C9 Fraction	----	10	mg/kg	<10	26 mg/kg	87.8	68	128
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions (QCLot: 795202)								
EP071: >C10 - C16 Fraction	----	50	mg/kg	<50	250 mg/kg	99.5	77	125
EP071: >C16 - C34 Fraction	----	100	mg/kg	<100	350 mg/kg	108	74	138
EP071: >C34 - C40 Fraction	----	100	mg/kg	<100	150 mg/kg	87.7	63	131
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions (QCLot: 796282)								
EP080: C6 - C10 Fraction	C6_C10	10	mg/kg	<10	31 mg/kg	82.2	68	128
EP080: BTEXN (QCLot: 796282)								
EP080: Benzene	71-43-2	0.2	mg/kg	<0.2	1 mg/kg	93.7	62	116
EP080: Toluene	108-88-3	0.5	mg/kg	<0.5	1 mg/kg	99.7	67	121
EP080: Ethylbenzene	100-41-4	0.5	mg/kg	<0.5	1 mg/kg	94.2	65	117
EP080: meta- & para-Xylene	108-38-3 106-42-3	0.5	mg/kg	<0.5	2 mg/kg	93.2	66	118
EP080: ortho-Xylene	95-47-6	0.5	mg/kg	<0.5	1 mg/kg	88.5	68	120
EP080: Naphthalene	91-20-3	1	mg/kg	<1	1 mg/kg	81.4	63	119
EP231A: Perfluoroalkyl Sulfonic Acids (QCLot: 796135)								
EP231X: Perfluorobutane sulfonic acid (PFBS)	375-73-5	0.0002	mg/kg	<0.0002	0.00125 mg/kg	103	57	121

Sub-Matrix: **SOIL**

Method: Compound	CAS Number	LOR	Unit	Method Blank (MB) Report: Result	Laboratory Control Spike (LCS) Report: Spike Concentration	Spike Recovery (%): LCS	Recovery Limits (%): Low	Recovery Limits (%): High
EP231A: Perfluoroalkyl Sulfonic Acids (QCLot: 796135) - continued								
EP231X: Perfluoropentane sulfonic acid (PFPeS)	2706-91-4	0.0002	mg/kg	<0.0002	0.00125 mg/kg	107	55	125
EP231X: Perfluorohexane sulfonic acid (PFHxS)	355-46-4	0.0002	mg/kg	<0.0002	0.00125 mg/kg	102	52	126
EP231X: Perfluoroheptane sulfonic acid (PFHpS)	375-92-8	0.0002	mg/kg	<0.0002	0.00125 mg/kg	101	54	123
EP231X: Perfluorooctane sulfonic acid (PFOS)	1763-23-1	0.0002	mg/kg	<0.0002	0.00125 mg/kg	119	55	127
EP231X: Perfluorodecane sulfonic acid (PFDS)	335-77-3	0.0002	mg/kg	<0.0002	0.00125 mg/kg	118	54	125
EP231B: Perfluoroalkyl Carboxylic Acids (QCLot: 796135)								
EP231X: Perfluorobutanoic acid (PFBA)	375-22-4	0.001	mg/kg	<0.001	0.00625 mg/kg	103	52	128
EP231X: Perfluoropentanoic acid (PFPeA)	2706-90-3	0.0002	mg/kg	<0.0002	0.00125 mg/kg	102	54	129
EP231X: Perfluorohexanoic acid (PFHxA)	307-24-4	0.0002	mg/kg	<0.0002	0.00125 mg/kg	92.9	58	127
EP231X: Perfluoroheptanoic acid (PFHpA)	375-85-9	0.0002	mg/kg	<0.0002	0.00125 mg/kg	104	57	128
EP231X: Perfluorooctanoic acid (PFOA)	335-67-1	0.0002	mg/kg	<0.0002	0.00125 mg/kg	109	60	134
EP231X: Perfluorononanoic acid (PFNA)	375-95-1	0.0002	mg/kg	<0.0002	0.00125 mg/kg	116	63	130
EP231X: Perfluorodecanoic acid (PFDA)	335-76-2	0.0002	mg/kg	<0.0002	0.00125 mg/kg	118	55	130
EP231X: Perfluoroundecanoic acid (PFUnDA)	2058-94-8	0.0002	mg/kg	<0.0002	0.00125 mg/kg	109	62	130
EP231X: Perfluorododecanoic acid (PFDoDA)	307-55-1	0.0002	mg/kg	<0.0002	0.00125 mg/kg	118	53	134
EP231X: Perfluorotridecanoic acid (PFTrDA)	72629-94-8	0.0002	mg/kg	<0.0002	0.00125 mg/kg	116	49	129
EP231X: Perfluorotetradecanoic acid (PFTeDA)	376-06-7	0.0005	mg/kg	<0.0005	0.00312 mg/kg	91.0	59	129
EP231C: Perfluoroalkyl Sulfonamides (QCLot: 796135)								
EP231X: Perfluorooctane sulfonamide (FOSA)	754-91-6	0.0002	mg/kg	<0.0002	0.00125 mg/kg	108	52	132
EP231X: N-Methyl perfluorooctane sulfonamide (MeFOSA)	31506-32-8	0.0005	mg/kg	<0.0005	0.00312 mg/kg	104	65	126
EP231X: N-Ethyl perfluorooctane sulfonamide (EtFOSA)	4151-50-2	0.0005	mg/kg	<0.0005	0.00312 mg/kg	106	64	126
EP231X: N-Methyl perfluorooctane sulfonamidoethanol (MeFOSE)	2448-09-7	0.0005	mg/kg	<0.0005	0.00312 mg/kg	107	63	124
EP231X: N-Ethyl perfluorooctane sulfonamidoethanol (EtFOSE)	1691-99-2	0.0005	mg/kg	<0.0005	0.00312 mg/kg	99.9	58	125
EP231X: N-Methyl perfluorooctane sulfonamidoacetic acid (MeFOSAA)	2355-31-9	0.0002	mg/kg	<0.0002	0.00125 mg/kg	106	61	130
EP231X: N-Ethyl perfluorooctane sulfonamidoacetic acid (EtFOSAA)	2991-50-6	0.0002	mg/kg	<0.0002	0.00125 mg/kg	103	55	130
EP231D: (n:2) Fluorotelomer Sulfonic Acids (QCLot: 796135)								
EP231X: 4:2 Fluorotelomer sulfonic acid (4:2 FTS)	757124-72-4	0.0005	mg/kg	<0.0005	0.00125 mg/kg	101	54	130
EP231X: 6:2 Fluorotelomer sulfonic acid (6:2 FTS)	27619-97-2	0.0005	mg/kg	<0.0005	0.00125 mg/kg	108	61	130
EP231X: 8:2 Fluorotelomer sulfonic acid (8:2 FTS)	39108-34-4	0.0005	mg/kg	<0.0005	0.00125 mg/kg	120	62	130
EP231X: 10:2 Fluorotelomer sulfonic acid (10:2 FTS)	120226-60-0	0.0005	mg/kg	<0.0005	0.00125 mg/kg	111	60	130

Sub-Matrix: **WATER**

Method: Compound	CAS Number	LOR	Unit	Method Blank (MB) Report: Result	Laboratory Control Spike (LCS) Report: Spike Concentration	Spike Recovery (%): LCS	Recovery Limits (%): Low	Recovery Limits (%): High
EA015: Total Dissolved Solids dried at 180 ± 5 °C (QCLot: 796824)								

Sub-Matrix: **WATER**

Method: Compound	CAS Number	LOR	Unit	Method Blank (MB) Report: Result	Laboratory Control Spike (LCS) Report: Spike Concentration	Spike Recovery (%): LCS	Recovery Limits (%): Low	Recovery Limits (%): High
EA015: Total Dissolved Solids dried at 180 ± 5 °C (QCLot: 796824) - continued								
EA015H: Total Dissolved Solids @180°C	----	10	mg/L	<10	2000 mg/L	88.7	87	109
				<10	293 mg/L	108	66	126
ED037P: Alkalinity by PC Titrator (QCLot: 795465)								
ED037-P: Total Alkalinity as CaCO3	----	----	mg/L	----	200 mg/L	97.1	81	111
ED041G: Sulfate (Turbidimetric) as SO4 2- by DA (QCLot: 794960)								
ED041G: Sulfate as SO4 - Turbidimetric	14808-79-8	1	mg/L	<1	25 mg/L	103	82	122
ED045G: Chloride by Discrete Analyser (QCLot: 794958)								
ED045G: Chloride	16887-00-6	1	mg/L	<1	10 mg/L	105	81	127
				<1	1000 mg/L	90.9	81	127
ED093F: Dissolved Major Cations (QCLot: 796247)								
ED093F: Calcium	7440-70-2	1	mg/L	<1	50 mg/L	96.1	80	114
ED093F: Magnesium	7439-95-4	1	mg/L	<1	50 mg/L	103	90	116
ED093F: Sodium	7440-23-5	1	mg/L	<1	50 mg/L	102	82	120
ED093F: Potassium	7440-09-7	1	mg/L	<1	50 mg/L	95.0	85	113
ED093F: Dissolved Major Cations (QCLot: 799292)								
ED093F: Calcium	7440-70-2	1	mg/L	<1	50 mg/L	95.2	80	114
ED093F: Magnesium	7439-95-4	1	mg/L	<1	50 mg/L	103	90	116
ED093F: Sodium	7440-23-5	1	mg/L	<1	50 mg/L	101	82	120
ED093F: Potassium	7440-09-7	1	mg/L	<1	50 mg/L	103	85	113
EG020F: Dissolved Metals by ICP-MS (QCLot: 799294)								
EG020A-F: Arsenic	7440-38-2	0.001	mg/L	<0.001	0.1 mg/L	103	85	114
EG020A-F: Cadmium	7440-43-9	0.0001	mg/L	<0.0001	0.1 mg/L	95.4	84	110
EG020A-F: Chromium	7440-47-3	0.001	mg/L	<0.001	0.1 mg/L	98.6	85	111
EG020A-F: Copper	7440-50-8	0.001	mg/L	<0.001	0.1 mg/L	96.5	81	111
EG020A-F: Lead	7439-92-1	0.001	mg/L	<0.001	0.1 mg/L	95.7	83	111
EG020A-F: Nickel	7440-02-0	0.001	mg/L	<0.001	0.1 mg/L	99.1	82	112
EG020A-F: Zinc	7440-66-6	0.005	mg/L	<0.005	0.1 mg/L	94.5	81	117
EG020T: Total Metals by ICP-MS (QCLot: 799267)								
EG020A-T: Arsenic	7440-38-2	0.001	mg/L	<0.001	0.1 mg/L	103	82	114
EG020A-T: Cadmium	7440-43-9	0.0001	mg/L	<0.0001	0.1 mg/L	96.4	84	112
EG020A-T: Chromium	7440-47-3	0.001	mg/L	<0.001	0.1 mg/L	110	86	116
EG020A-T: Copper	7440-50-8	0.001	mg/L	<0.001	0.1 mg/L	104	83	118
EG020A-T: Lead	7439-92-1	0.001	mg/L	<0.001	0.1 mg/L	99.1	85	115
EG020A-T: Nickel	7440-02-0	0.001	mg/L	<0.001	0.1 mg/L	105	84	116
EG020A-T: Zinc	7440-66-6	0.005	mg/L	<0.005	0.1 mg/L	99.2	79	117
EG035F: Dissolved Mercury by FIMS (QCLot: 799293)								
EG035F: Mercury	7439-97-6	0.0001	mg/L	<0.0001	0.01 mg/L	96.3	83	105

Sub-Matrix: **WATER**

Method: Compound	CAS Number	LOR	Unit	Method Blank (MB) Report	Laboratory Control Spike (LCS) Report			
					Spike	Spike Recovery (%)	Recovery Limits (%)	
				Result	Concentration	LCS	Low	High
EG035T: Total Recoverable Mercury by FIMS (QCLot: 799952)								
EG035T: Mercury	7439-97-6	0.0001	mg/L	<0.0001	0.01 mg/L	100	77	111
EP005: Total Organic Carbon (TOC) (QCLot: 794952)								
EP005: Total Organic Carbon	----	1	mg/L	<1	10 mg/L	94.3	72	120
EP005: Total Organic Carbon (TOC) (QCLot: 799316)								
EP005: Total Organic Carbon	----	1	mg/L	<1	10 mg/L	88.5	72	120
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons (QCLot: 795423)								
EP075(SIM): Naphthalene	91-20-3	1	µg/L	<1.0	5 µg/L	71.0	50	94
EP075(SIM): Acenaphthylene	208-96-8	1	µg/L	<1.0	5 µg/L	87.6	64	114
EP075(SIM): Acenaphthene	83-32-9	1	µg/L	<1.0	5 µg/L	83.6	62	113
EP075(SIM): Fluorene	86-73-7	1	µg/L	<1.0	5 µg/L	88.0	64	115
EP075(SIM): Phenanthrene	85-01-8	1	µg/L	<1.0	5 µg/L	87.2	63	116
EP075(SIM): Anthracene	120-12-7	1	µg/L	<1.0	5 µg/L	82.8	64	116
EP075(SIM): Fluoranthene	206-44-0	1	µg/L	<1.0	5 µg/L	83.2	64	118
EP075(SIM): Pyrene	129-00-0	1	µg/L	<1.0	5 µg/L	94.4	63	118
EP075(SIM): Benz(a)anthracene	56-55-3	1	µg/L	<1.0	5 µg/L	86.6	64	117
EP075(SIM): Chrysene	218-01-9	1	µg/L	<1.0	5 µg/L	86.4	63	116
EP075(SIM): Benzo(b+j)fluoranthene	205-99-2 205-82-3	1	µg/L	<1.0	5 µg/L	73.4	62	119
EP075(SIM): Benzo(k)fluoranthene	207-08-9	1	µg/L	<1.0	5 µg/L	72.9	63	115
EP075(SIM): Benzo(a)pyrene	50-32-8	0.5	µg/L	<0.5	5 µg/L	80.7	63	117
EP075(SIM): Indeno(1.2.3.cd)pyrene	193-39-5	1	µg/L	<1.0	5 µg/L	67.2	60	118
EP075(SIM): Dibenz(a.h)anthracene	53-70-3	1	µg/L	<1.0	5 µg/L	68.5	61	117
EP075(SIM): Benzo(g.h.i)perylene	191-24-2	1	µg/L	<1.0	5 µg/L	69.7	59	118
EP080/071: Total Petroleum Hydrocarbons (QCLot: 795350)								
EP080: C6 - C9 Fraction	----	20	µg/L	<20	260 µg/L	94.9	75	127
EP080/071: Total Petroleum Hydrocarbons (QCLot: 795424)								
EP071: C10 - C14 Fraction	----	50	µg/L	<50	2000 µg/L	99.2	76	116
EP071: C15 - C28 Fraction	----	100	µg/L	<100	3000 µg/L	97.7	83	109
EP071: C29 - C36 Fraction	----	50	µg/L	<50	2000 µg/L	93.0	75	113
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions (QCLot: 795350)								
EP080: C6 - C10 Fraction	C6_C10	20	µg/L	<20	310 µg/L	95.4	75	127
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions (QCLot: 795424)								
EP071: >C10 - C16 Fraction	----	100	µg/L	<100	2500 µg/L	98.4	76	114
EP071: >C16 - C34 Fraction	----	100	µg/L	<100	3500 µg/L	95.4	81	111
EP071: >C34 - C40 Fraction	----	100	µg/L	<100	1500 µg/L	100	77	119
EP080: BTEXN (QCLot: 795350)								
EP080: Benzene	71-43-2	1	µg/L	<1	10 µg/L	99.8	70	122
EP080: Toluene	108-88-3	2	µg/L	<2	10 µg/L	97.5	69	123

Sub-Matrix: **WATER**

Method: Compound	CAS Number	LOR	Unit	Method Blank (MB) Report	Laboratory Control Spike (LCS) Report			
					Spike	Spike Recovery (%)	Recovery Limits (%)	
				Result	Concentration	LCS	Low	High
EP080: BTEXN (QCLot: 795350) - continued								
EP080: Ethylbenzene	100-41-4	2	µg/L	<2	10 µg/L	94.0	70	120
EP080: meta- & para-Xylene	108-38-3 106-42-3	2	µg/L	<2	10 µg/L	93.5	69	121
EP080: ortho-Xylene	95-47-6	2	µg/L	<2	10 µg/L	100	72	122
EP080: Naphthalene	91-20-3	5	µg/L	<5	10 µg/L	98.5	70	120
EP231A: Perfluoroalkyl Sulfonic Acids (QCLot: 796142)								
EP231X: Perfluorobutane sulfonic acid (PFBS)	375-73-5	0.02	µg/L	<0.02	0.5 µg/L	92.0	70	130
EP231X: Perfluoropentane sulfonic acid (PFPeS)	2706-91-4	0.02	µg/L	<0.02	0.5 µg/L	86.0	70	130
EP231X: Perfluorohexane sulfonic acid (PFHxS)	355-46-4	0.02	µg/L	<0.02	0.5 µg/L	110	70	130
EP231X: Perfluoroheptane sulfonic acid (PFHpS)	375-92-8	0.02	µg/L	<0.02	0.5 µg/L	102	70	130
EP231X: Perfluorooctane sulfonic acid (PFOS)	1763-23-1	0.01	µg/L	<0.01	0.5 µg/L	104	70	130
EP231X: Perfluorodecane sulfonic acid (PFDS)	335-77-3	0.02	µg/L	<0.02	0.5 µg/L	106	70	130
EP231A: Perfluoroalkyl Sulfonic Acids (QCLot: 798140)								
EP231X: Perfluorobutane sulfonic acid (PFBS)	375-73-5	0.02	µg/L	<0.02	0.5 µg/L	91.8	70	130
EP231X: Perfluoropentane sulfonic acid (PFPeS)	2706-91-4	0.02	µg/L	<0.02	0.5 µg/L	92.8	70	130
EP231X: Perfluorohexane sulfonic acid (PFHxS)	355-46-4	0.02	µg/L	<0.02	0.5 µg/L	91.2	70	130
EP231X: Perfluoroheptane sulfonic acid (PFHpS)	375-92-8	0.02	µg/L	<0.02	0.5 µg/L	97.4	70	130
EP231X: Perfluorooctane sulfonic acid (PFOS)	1763-23-1	0.01	µg/L	<0.01	0.5 µg/L	115	70	130
EP231X: Perfluorodecane sulfonic acid (PFDS)	335-77-3	0.02	µg/L	<0.02	0.5 µg/L	96.2	70	130
EP231B: Perfluoroalkyl Carboxylic Acids (QCLot: 796142)								
EP231X: Perfluorobutanoic acid (PFBA)	375-22-4	0.1	µg/L	<0.1	2.5 µg/L	83.2	70	130
EP231X: Perfluoropentanoic acid (PFPeA)	2706-90-3	0.02	µg/L	<0.02	0.5 µg/L	83.8	70	130
EP231X: Perfluorohexanoic acid (PFHxA)	307-24-4	0.02	µg/L	<0.02	0.5 µg/L	88.2	70	130
EP231X: Perfluoroheptanoic acid (PFHpA)	375-85-9	0.02	µg/L	<0.02	0.5 µg/L	110	70	130
EP231X: Perfluorooctanoic acid (PFOA)	335-67-1	0.01	µg/L	<0.01	0.5 µg/L	105	70	130
EP231X: Perfluorononanoic acid (PFNA)	375-95-1	0.02	µg/L	<0.02	0.5 µg/L	89.8	70	130
EP231X: Perfluorodecanoic acid (PFDA)	335-76-2	0.02	µg/L	<0.02	0.5 µg/L	120	70	130
EP231X: Perfluoroundecanoic acid (PFUnDA)	2058-94-8	0.02	µg/L	<0.02	0.5 µg/L	80.2	70	130
EP231X: Perfluorododecanoic acid (PFDoDA)	307-55-1	0.02	µg/L	<0.02	0.5 µg/L	83.0	70	130
EP231X: Perfluorotridecanoic acid (PFTrDA)	72629-94-8	0.02	µg/L	<0.02	0.5 µg/L	105	70	130
EP231X: Perfluorotetradecanoic acid (PFTeDA)	376-06-7	0.05	µg/L	<0.05	1.25 µg/L	115	70	124
EP231B: Perfluoroalkyl Carboxylic Acids (QCLot: 798140)								
EP231X: Perfluorobutanoic acid (PFBA)	375-22-4	0.1	µg/L	<0.1	2.5 µg/L	87.3	70	130
EP231X: Perfluoropentanoic acid (PFPeA)	2706-90-3	0.02	µg/L	<0.02	0.5 µg/L	92.0	70	130
EP231X: Perfluorohexanoic acid (PFHxA)	307-24-4	0.02	µg/L	<0.02	0.5 µg/L	99.4	70	130
EP231X: Perfluoroheptanoic acid (PFHpA)	375-85-9	0.02	µg/L	<0.02	0.5 µg/L	105	70	130
EP231X: Perfluorooctanoic acid (PFOA)	335-67-1	0.01	µg/L	<0.01	0.5 µg/L	85.2	70	130
EP231X: Perfluorononanoic acid (PFNA)	375-95-1	0.02	µg/L	<0.02	0.5 µg/L	95.4	70	130

Sub-Matrix: **WATER**

Method: Compound	CAS Number	LOR	Unit	Method Blank (MB) Report	Laboratory Control Spike (LCS) Report			
					Spike	Spike Recovery (%)	Recovery Limits (%)	
				Result	Concentration	LCS	Low	High
EP231B: Perfluoroalkyl Carboxylic Acids (QCLot: 798140) - continued								
EP231X: Perfluorodecanoic acid (PFDA)	335-76-2	0.02	µg/L	<0.02	0.5 µg/L	82.4	70	130
EP231X: Perfluoroundecanoic acid (PFUnDA)	2058-94-8	0.02	µg/L	<0.02	0.5 µg/L	102	70	130
EP231X: Perfluorododecanoic acid (PFDoDA)	307-55-1	0.02	µg/L	<0.02	0.5 µg/L	94.8	70	130
EP231X: Perfluorotridecanoic acid (PFTrDA)	72629-94-8	0.02	µg/L	<0.02	0.5 µg/L	99.2	70	130
EP231X: Perfluorotetradecanoic acid (PFTeDA)	376-06-7	0.05	µg/L	<0.05	1.25 µg/L	110	70	124
EP231C: Perfluoroalkyl Sulfonamides (QCLot: 796142)								
EP231X: Perfluorooctane sulfonamide (FOSA)	754-91-6	0.02	µg/L	<0.02	0.5 µg/L	110	70	130
EP231X: N-Methyl perfluorooctane sulfonamide (MeFOSA)	31506-32-8	0.05	µg/L	<0.05	1.25 µg/L	93.8	70	130
EP231X: N-Ethyl perfluorooctane sulfonamide (EtFOSA)	4151-50-2	0.05	µg/L	<0.05	1.25 µg/L	98.2	70	129
EP231X: N-Methyl perfluorooctane sulfonamidoethanol (MeFOSE)	2448-09-7	0.05	µg/L	<0.05	1.25 µg/L	109	70	129
EP231X: N-Ethyl perfluorooctane sulfonamidoethanol (EtFOSE)	1691-99-2	0.05	µg/L	<0.05	1.25 µg/L	107	70	126
EP231X: N-Methyl perfluorooctane sulfonamidoacetic acid (MeFOSAA)	2355-31-9	0.02	µg/L	<0.02	0.5 µg/L	110	70	130
EP231X: N-Ethyl perfluorooctane sulfonamidoacetic acid (EtFOSAA)	2991-50-6	0.02	µg/L	<0.02	0.5 µg/L	103	70	130
EP231C: Perfluoroalkyl Sulfonamides (QCLot: 798140)								
EP231X: Perfluorooctane sulfonamide (FOSA)	754-91-6	0.02	µg/L	<0.02	0.5 µg/L	111	70	130
EP231X: N-Methyl perfluorooctane sulfonamide (MeFOSA)	31506-32-8	0.05	µg/L	<0.05	1.25 µg/L	118	70	130
EP231X: N-Ethyl perfluorooctane sulfonamide (EtFOSA)	4151-50-2	0.05	µg/L	<0.05	1.25 µg/L	120	70	129
EP231X: N-Methyl perfluorooctane sulfonamidoethanol (MeFOSE)	2448-09-7	0.05	µg/L	<0.05	1.25 µg/L	107	70	129
EP231X: N-Ethyl perfluorooctane sulfonamidoethanol (EtFOSE)	1691-99-2	0.05	µg/L	<0.05	1.25 µg/L	115	70	126
EP231X: N-Methyl perfluorooctane sulfonamidoacetic acid (MeFOSAA)	2355-31-9	0.02	µg/L	<0.02	0.5 µg/L	101	70	130
EP231X: N-Ethyl perfluorooctane sulfonamidoacetic acid (EtFOSAA)	2991-50-6	0.02	µg/L	<0.02	0.5 µg/L	95.8	70	130
EP231D: (n:2) Fluorotelomer Sulfonic Acids (QCLot: 796142)								
EP231X: 4:2 Fluorotelomer sulfonic acid (4:2 FTS)	757124-72-4	0.05	µg/L	<0.05	0.5 µg/L	104	70	130
EP231X: 6:2 Fluorotelomer sulfonic acid (6:2 FTS)	27619-97-2	0.05	µg/L	<0.05	0.5 µg/L	122	70	130
EP231X: 8:2 Fluorotelomer sulfonic acid (8:2 FTS)	39108-34-4	0.05	µg/L	<0.05	0.5 µg/L	126	70	130
EP231X: 10:2 Fluorotelomer sulfonic acid (10:2 FTS)	120226-60-0	0.05	µg/L	<0.05	0.5 µg/L	124	70	130
EP231D: (n:2) Fluorotelomer Sulfonic Acids (QCLot: 798140)								
EP231X: 4:2 Fluorotelomer sulfonic acid (4:2 FTS)	757124-72-4	0.05	µg/L	<0.05	0.5 µg/L	93.4	70	130
EP231X: 6:2 Fluorotelomer sulfonic acid (6:2 FTS)	27619-97-2	0.05	µg/L	<0.05	0.5 µg/L	102	70	130
EP231X: 8:2 Fluorotelomer sulfonic acid (8:2 FTS)	39108-34-4	0.05	µg/L	<0.05	0.5 µg/L	95.2	70	130
EP231X: 10:2 Fluorotelomer sulfonic acid (10:2 FTS)	120226-60-0	0.05	µg/L	<0.05	0.5 µg/L	114	70	130

Matrix Spike (MS) Report

The quality control term Matrix Spike (MS) refers to an intralaboratory split sample spiked with a representative set of target analytes. The purpose of this QC parameter is to monitor potential matrix effects on analyte recoveries. Static Recovery Limits as per laboratory Data Quality Objectives (DQOs). Ideal recovery ranges stated may be waived in the event of sample matrix interference.

Sub-Matrix: **SOIL**

				Matrix Spike (MS) Report			
				Spike	SpikeRecovery(%)	Recovery Limits (%)	
Laboratory sample ID	Client sample ID	Method: Compound	CAS Number	Concentration	MS	Low	High
ED045G: Chloride by Discrete Analyser (QCLot: 800744)							
ES1705860-001	Anonymous	ED045G: Chloride	16887-00-6	1250 mg/kg	113	70	130
EG005T: Total Metals by ICP-AES (QCLot: 797415)							
ES1706074-002	Anonymous	EG005T: Arsenic	7440-38-2	50 mg/kg	104	70	130
		EG005T: Cadmium	7440-43-9	50 mg/kg	104	70	130
		EG005T: Chromium	7440-47-3	50 mg/kg	103	70	130
		EG005T: Copper	7440-50-8	250 mg/kg	103	70	130
		EG005T: Lead	7439-92-1	250 mg/kg	87.0	70	130
		EG005T: Nickel	7440-02-0	50 mg/kg	99.5	70	130
		EG005T: Zinc	7440-66-6	250 mg/kg	91.2	70	130
EG035T: Total Recoverable Mercury by FIMS (QCLot: 797416)							
ES1706074-002	Anonymous	EG035T: Mercury	7439-97-6	5 mg/kg	93.9	70	130
EP004: Organic Matter (QCLot: 799164)							
ES1706078-003	Anonymous	EP004: Total Organic Carbon	----	2.66 %	# Not Determined	70	130
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons (QCLot: 795201)							
ES1706085-001	Anonymous	EP075(SIM): Acenaphthene	83-32-9	10 mg/kg	98.5	70	130
		EP075(SIM): Pyrene	129-00-0	10 mg/kg	106	70	130
EP080/071: Total Petroleum Hydrocarbons (QCLot: 795202)							
ES1706085-001	Anonymous	EP071: C10 - C14 Fraction	----	523 mg/kg	84.7	73	137
		EP071: C15 - C28 Fraction	----	2319 mg/kg	97.7	53	131
		EP071: C29 - C36 Fraction	----	1714 mg/kg	96.2	52	132
EP080/071: Total Petroleum Hydrocarbons (QCLot: 796282)							
ES1706190-006	SS01 TCLP LEACHATE	EP080: C6 - C9 Fraction	----	32.5 mg/kg	76.7	70	130
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions (QCLot: 795202)							
ES1706085-001	Anonymous	EP071: >C10 - C16 Fraction	----	860 mg/kg	89.5	73	137
		EP071: >C16 - C34 Fraction	----	3223 mg/kg	95.3	53	131
		EP071: >C34 - C40 Fraction	----	1058 mg/kg	98.1	52	132
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions (QCLot: 796282)							
ES1706190-006	SS01 TCLP LEACHATE	EP080: C6 - C10 Fraction	C6_C10	37.5 mg/kg	75.0	70	130
EP080: BTEXN (QCLot: 796282)							
ES1706190-006	SS01 TCLP LEACHATE	EP080: Benzene	71-43-2	2.5 mg/kg	83.1	70	130

Sub-Matrix: **SOIL**

				Matrix Spike (MS) Report			
				Spike	SpikeRecovery(%)	Recovery Limits (%)	
Laboratory sample ID	Client sample ID	Method: Compound	CAS Number	Concentration	MS	Low	High
EP080: BTEXN (QCLot: 796282) - continued							
ES1706190-006	SS01 TCLP LEACHATE	EP080: Toluene	108-88-3	2.5 mg/kg	86.7	70	130
		EP080: Ethylbenzene	100-41-4	2.5 mg/kg	87.1	70	130
		EP080: meta- & para-Xylene	108-38-3 106-42-3	2.5 mg/kg	84.0	70	130
		EP080: ortho-Xylene	95-47-6	2.5 mg/kg	83.0	70	130
		EP080: Naphthalene	91-20-3	2.5 mg/kg	71.7	70	130
EP231A: Perfluoroalkyl Sulfonic Acids (QCLot: 796135)							
ES1706190-006	SS01 TCLP LEACHATE	EP231X: Perfluorobutane sulfonic acid (PFBS)	375-73-5	0.00125 mg/kg	107	50	130
		EP231X: Perfluoropentane sulfonic acid (PFPeS)	2706-91-4	0.00125 mg/kg	110	50	130
		EP231X: Perfluorohexane sulfonic acid (PFHxS)	355-46-4	0.00125 mg/kg	97.0	50	130
		EP231X: Perfluoroheptane sulfonic acid (PFHpS)	375-92-8	0.00125 mg/kg	118	50	130
		EP231X: Perfluorooctane sulfonic acid (PFOS)	1763-23-1	0.00125 mg/kg	72.9	50	130
		EP231X: Perfluorodecane sulfonic acid (PFDS)	335-77-3	0.00125 mg/kg	108	50	130
EP231B: Perfluoroalkyl Carboxylic Acids (QCLot: 796135)							
ES1706190-006	SS01 TCLP LEACHATE	EP231X: Perfluorobutanoic acid (PFBA)	375-22-4	0.00625 mg/kg	81.6	30	130
		EP231X: Perfluoropentanoic acid (PFPeA)	2706-90-3	0.00125 mg/kg	111	50	130
		EP231X: Perfluorohexanoic acid (PFHxA)	307-24-4	0.00125 mg/kg	103	50	130
		EP231X: Perfluoroheptanoic acid (PFHpA)	375-85-9	0.00125 mg/kg	99.6	50	130
		EP231X: Perfluorooctanoic acid (PFOA)	335-67-1	0.00125 mg/kg	109	50	130
		EP231X: Perfluorononanoic acid (PFNA)	375-95-1	0.00125 mg/kg	51.6	50	130
		EP231X: Perfluorodecanoic acid (PFDA)	335-76-2	0.00125 mg/kg	62.8	50	130
		EP231X: Perfluoroundecanoic acid (PFUnDA)	2058-94-8	0.00125 mg/kg	53.3	50	130
		EP231X: Perfluorododecanoic acid (PFDoDA)	307-55-1	0.00125 mg/kg	105	50	130
		EP231X: Perfluorotridecanoic acid (PFTrDA)	72629-94-8	0.00125 mg/kg	45.8	30	130
		EP231X: Perfluorotetradecanoic acid (PFTeDA)	376-06-7	0.00312 mg/kg	51.1	30	130
EP231C: Perfluoroalkyl Sulfonamides (QCLot: 796135)							
ES1706190-006	SS01 TCLP LEACHATE	EP231X: Perfluorooctane sulfonamide (FOSA)	754-91-6	0.00125 mg/kg	66.8	50	130
		EP231X: N-Methyl perfluorooctane sulfonamide (MeFOSA)	31506-32-8	0.00312 mg/kg	101	30	130
		EP231X: N-Ethyl perfluorooctane sulfonamide (EtFOSA)	4151-50-2	0.00312 mg/kg	95.9	30	130
		EP231X: N-Methyl perfluorooctane sulfonamidoethanol (MeFOSE)	2448-09-7	0.00312 mg/kg	102	30	130
		EP231X: N-Ethyl perfluorooctane sulfonamidoethanol (EtFOSE)	1691-99-2	0.00312 mg/kg	113	30	130
		EP231X: N-Methyl perfluorooctane sulfonamidoacetic acid (MeFOSAA)	2355-31-9	0.00125 mg/kg	114	30	130
		EP231X: N-Ethyl perfluorooctane sulfonamidoacetic acid (EtFOSAA)	2991-50-6	0.00125 mg/kg	122	30	130

Sub-Matrix: **SOIL**

Laboratory sample ID	Client sample ID	Method: Compound	CAS Number	Matrix Spike (MS) Report: Spike Concentration	Matrix Spike (MS) Report: SpikeRecovery(%) MS	Matrix Spike (MS) Report: Recovery Limits (%) Low	Matrix Spike (MS) Report: Recovery Limits (%) High
EP231D: (n:2) Fluorotelomer Sulfonic Acids (QCLot: 796135)							
ES1706190-006	SS01 TCLP LEACHATE	EP231X: 4:2 Fluorotelomer sulfonic acid (4:2 FTS)	757124-72-4	0.00125 mg/kg	118	50	130
		EP231X: 6:2 Fluorotelomer sulfonic acid (6:2 FTS)	27619-97-2	0.00125 mg/kg	115	50	130
		EP231X: 8:2 Fluorotelomer sulfonic acid (8:2 FTS)	39108-34-4	0.00125 mg/kg	104	50	130
		EP231X: 10:2 Fluorotelomer sulfonic acid (10:2 FTS)	120226-60-0	0.00125 mg/kg	111	50	130

Sub-Matrix: **WATER**

Laboratory sample ID	Client sample ID	Method: Compound	CAS Number	Matrix Spike (MS) Report: Spike Concentration	Matrix Spike (MS) Report: SpikeRecovery(%) MS	Matrix Spike (MS) Report: Recovery Limits (%) Low	Matrix Spike (MS) Report: Recovery Limits (%) High
ED041G: Sulfate (Turbidimetric) as SO4 2- by DA (QCLot: 794960)							
ES1706139-001	Anonymous	ED041G: Sulfate as SO4 - Turbidimetric	14808-79-8	10 mg/L	# Not Determined	70	130
ED045G: Chloride by Discrete Analyser (QCLot: 794958)							
ES1705907-002	Anonymous	ED045G: Chloride	16887-00-6	250 mg/L	96.9	70	130
EG020F: Dissolved Metals by ICP-MS (QCLot: 799294)							
ES1706190-002	SW02	EG020A-F: Arsenic	7440-38-2	1 mg/L	106	70	130
		EG020A-F: Cadmium	7440-43-9	0.25 mg/L	102	70	130
		EG020A-F: Chromium	7440-47-3	1 mg/L	97.3	70	130
		EG020A-F: Copper	7440-50-8	1 mg/L	98.8	70	130
		EG020A-F: Lead	7439-92-1	1 mg/L	98.7	70	130
		EG020A-F: Nickel	7440-02-0	1 mg/L	99.7	70	130
		EG020A-F: Zinc	7440-66-6	1 mg/L	107	70	130
EG020T: Total Metals by ICP-MS (QCLot: 799267)							
ES1706112-002	Anonymous	EG020A-T: Arsenic	7440-38-2	1 mg/L	103	70	130
		EG020A-T: Cadmium	7440-43-9	0.25 mg/L	95.3	70	130
		EG020A-T: Chromium	7440-47-3	1 mg/L	105	70	130
		EG020A-T: Copper	7440-50-8	1 mg/L	98.4	70	130
		EG020A-T: Lead	7439-92-1	1 mg/L	97.1	70	130
		EG020A-T: Nickel	7440-02-0	1 mg/L	99.8	70	130
		EG020A-T: Zinc	7440-66-6	1 mg/L	93.7	70	130
EG035F: Dissolved Mercury by FIMS (QCLot: 799293)							
ES1706089-001	Anonymous	EG035F: Mercury	7439-97-6	0.01 mg/L	# 47.7	70	130
EG035T: Total Recoverable Mercury by FIMS (QCLot: 799952)							
ES1706261-001	Anonymous	EG035T: Mercury	7439-97-6	0.01 mg/L	78.9	70	130
EP005: Total Organic Carbon (TOC) (QCLot: 794952)							
ES1705707-001	Anonymous	EP005: Total Organic Carbon	----	100 mg/L	97.0	70	130
EP005: Total Organic Carbon (TOC) (QCLot: 799316)							
ES1706112-004	Anonymous	EP005: Total Organic Carbon	----	100 mg/L	82.7	70	130

Sub-Matrix: **WATER**

				Matrix Spike (MS) Report			
				Spike	SpikeRecovery(%)	Recovery Limits (%)	
Laboratory sample ID	Client sample ID	Method: Compound	CAS Number	Concentration	MS	Low	High
EP080/071: Total Petroleum Hydrocarbons (QCLot: 795350)							
EB1704939-001	Anonymous	EP080: C6 - C9 Fraction	----	325 µg/L	97.1	70	130
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions (QCLot: 795350)							
EB1704939-001	Anonymous	EP080: C6 - C10 Fraction	C6_C10	375 µg/L	95.2	70	130
EP080: BTEXN (QCLot: 795350)							
EB1704939-001	Anonymous	EP080: Benzene	71-43-2	25 µg/L	87.4	70	130
		EP080: Toluene	108-88-3	25 µg/L	87.9	70	130
		EP080: Ethylbenzene	100-41-4	25 µg/L	93.0	70	130
		EP080: meta- & para-Xylene	108-38-3 106-42-3	25 µg/L	93.5	70	130
		EP080: ortho-Xylene	95-47-6	25 µg/L	98.1	70	130
		EP080: Naphthalene	91-20-3	25 µg/L	97.7	70	130
EP231A: Perfluoroalkyl Sulfonic Acids (QCLot: 796142)							
EP1702379-001	Anonymous	EP231X: Perfluorobutane sulfonic acid (PFBS)	375-73-5	0.5 µg/L	89.6	50	130
		EP231X: Perfluoropentane sulfonic acid (PFPeS)	2706-91-4	0.5 µg/L	91.2	50	130
		EP231X: Perfluorohexane sulfonic acid (PFHxS)	355-46-4	0.5 µg/L	100	50	130
		EP231X: Perfluoroheptane sulfonic acid (PFHpS)	375-92-8	0.5 µg/L	86.4	50	130
		EP231X: Perfluorooctane sulfonic acid (PFOS)	1763-23-1	0.5 µg/L	106	50	130
		EP231X: Perfluorodecane sulfonic acid (PFDS)	335-77-3	0.5 µg/L	92.4	50	130
EP231A: Perfluoroalkyl Sulfonic Acids (QCLot: 798140)							
ES1706190-006	SS01 TCLP LEACHATE	EP231X: Perfluorobutane sulfonic acid (PFBS)	375-73-5	0.5 µg/L	109	50	130
		EP231X: Perfluoropentane sulfonic acid (PFPeS)	2706-91-4	0.5 µg/L	120	50	130
		EP231X: Perfluorohexane sulfonic acid (PFHxS)	355-46-4	0.5 µg/L	112	50	130
		EP231X: Perfluoroheptane sulfonic acid (PFHpS)	375-92-8	0.5 µg/L	128	50	130
		EP231X: Perfluorooctane sulfonic acid (PFOS)	1763-23-1	0.5 µg/L	97.2	50	130
		EP231X: Perfluorodecane sulfonic acid (PFDS)	335-77-3	0.5 µg/L	97.8	50	130
EP231B: Perfluoroalkyl Carboxylic Acids (QCLot: 796142)							
EP1702379-001	Anonymous	EP231X: Perfluorobutanoic acid (PFBA)	375-22-4	2.5 µg/L	67.2	50	130
		EP231X: Perfluoropentanoic acid (PFPeA)	2706-90-3	0.5 µg/L	78.0	50	130
		EP231X: Perfluorohexanoic acid (PFHxA)	307-24-4	0.5 µg/L	79.8	50	130
		EP231X: Perfluoroheptanoic acid (PFHpA)	375-85-9	0.5 µg/L	99.8	50	130
		EP231X: Perfluorooctanoic acid (PFOA)	335-67-1	0.5 µg/L	118	50	130
		EP231X: Perfluorononanoic acid (PFNA)	375-95-1	0.5 µg/L	94.4	50	130
		EP231X: Perfluorodecanoic acid (PFDA)	335-76-2	0.5 µg/L	109	50	130
		EP231X: Perfluoroundecanoic acid (PFUnDA)	2058-94-8	0.5 µg/L	85.6	50	130
		EP231X: Perfluorododecanoic acid (PFDoDA)	307-55-1	0.5 µg/L	91.0	50	130
		EP231X: Perfluorotridecanoic acid (PFTrDA)	72629-94-8	0.5 µg/L	82.0	50	130
		EP231X: Perfluorotetradecanoic acid (PFTeDA)	376-06-7	1.25 µg/L	112	50	130

Sub-Matrix: **WATER**

				Matrix Spike (MS) Report			
				Spike	SpikeRecovery(%)	Recovery Limits (%)	
Laboratory sample ID	Client sample ID	Method: Compound	CAS Number	Concentration	MS	Low	High
EP231B: Perfluoroalkyl Carboxylic Acids (QCLot: 798140)							
ES1706190-006	SS01 TCLP LEACHATE	EP231X: Perfluorobutanoic acid (PFBA)	375-22-4	2.5 µg/L	76.8	50	130
		EP231X: Perfluoropentanoic acid (PFPeA)	2706-90-3	0.5 µg/L	82.0	50	130
		EP231X: Perfluorohexanoic acid (PFHxA)	307-24-4	0.5 µg/L	79.6	50	130
		EP231X: Perfluoroheptanoic acid (PFHpA)	375-85-9	0.5 µg/L	101	50	130
		EP231X: Perfluorooctanoic acid (PFOA)	335-67-1	0.5 µg/L	104	50	130
		EP231X: Perfluorononanoic acid (PFNA)	375-95-1	0.5 µg/L	113	50	130
		EP231X: Perfluorodecanoic acid (PFDA)	335-76-2	0.5 µg/L	104	50	130
		EP231X: Perfluoroundecanoic acid (PFUnDA)	2058-94-8	0.5 µg/L	115	50	130
		EP231X: Perfluorododecanoic acid (PFDoDA)	307-55-1	0.5 µg/L	93.4	50	130
		EP231X: Perfluorotridecanoic acid (PFTrDA)	72629-94-8	0.5 µg/L	114	50	130
		EP231X: Perfluorotetradecanoic acid (PFTeDA)	376-06-7	1.25 µg/L	85.0	50	130
EP231C: Perfluoroalkyl Sulfonamides (QCLot: 796142)							
EP1702379-001	Anonymous	EP231X: Perfluorooctane sulfonamide (FOSA)	754-91-6	0.5 µg/L	102	50	130
		EP231X: N-Methyl perfluorooctane sulfonamide (MeFOSA)	31506-32-8	1.25 µg/L	88.1	50	130
		EP231X: N-Ethyl perfluorooctane sulfonamide (EtFOSA)	4151-50-2	1.25 µg/L	97.5	50	130
		EP231X: N-Methyl perfluorooctane sulfonamidoethanol (MeFOSE)	2448-09-7	1.25 µg/L	109	50	130
		EP231X: N-Ethyl perfluorooctane sulfonamidoethanol (EtFOSE)	1691-99-2	1.25 µg/L	106	50	130
		EP231X: N-Methyl perfluorooctane sulfonamidoacetic acid (MeFOSAA)	2355-31-9	0.5 µg/L	100	50	130
		EP231X: N-Ethyl perfluorooctane sulfonamidoacetic acid (EtFOSAA)	2991-50-6	0.5 µg/L	100	50	130
EP231C: Perfluoroalkyl Sulfonamides (QCLot: 798140)							
ES1706190-006	SS01 TCLP LEACHATE	EP231X: Perfluorooctane sulfonamide (FOSA)	754-91-6	0.5 µg/L	86.2	50	130
		EP231X: N-Methyl perfluorooctane sulfonamide (MeFOSA)	31506-32-8	1.25 µg/L	118	50	130
		EP231X: N-Ethyl perfluorooctane sulfonamide (EtFOSA)	4151-50-2	1.25 µg/L	118	50	130
		EP231X: N-Methyl perfluorooctane sulfonamidoethanol (MeFOSE)	2448-09-7	1.25 µg/L	114	50	130
		EP231X: N-Ethyl perfluorooctane sulfonamidoethanol (EtFOSE)	1691-99-2	1.25 µg/L	119	50	130
		EP231X: N-Methyl perfluorooctane sulfonamidoacetic acid (MeFOSAA)	2355-31-9	0.5 µg/L	104	50	130
		EP231X: N-Ethyl perfluorooctane sulfonamidoacetic acid (EtFOSAA)	2991-50-6	0.5 µg/L	104	50	130
EP231D: (n:2) Fluorotelomer Sulfonic Acids (QCLot: 796142)							
EP1702379-001	Anonymous	EP231X: 4:2 Fluorotelomer sulfonic acid (4:2 FTS)	757124-72-4	0.5 µg/L	123	50	130

Sub-Matrix: **WATER**

				Matrix Spike (MS) Report			
				Spike	SpikeRecovery(%)	Recovery Limits (%)	
Laboratory sample ID	Client sample ID	Method: Compound	CAS Number	Concentration	MS	Low	High
EP231D: (n:2) Fluorotelomer Sulfonic Acids (QCLot: 796142) - continued							
EP1702379-001	Anonymous	EP231X: 6:2 Fluorotelomer sulfonic acid (6:2 FTS)	27619-97-2	0.5 µg/L	110	50	130
		EP231X: 8:2 Fluorotelomer sulfonic acid (8:2 FTS)	39108-34-4	0.5 µg/L	116	50	130
		EP231X: 10:2 Fluorotelomer sulfonic acid (10:2 FTS)	120226-60-0	0.5 µg/L	120	50	130
EP231D: (n:2) Fluorotelomer Sulfonic Acids (QCLot: 798140)							
ES1706190-006	SS01 TCLP LEACHATE	EP231X: 4:2 Fluorotelomer sulfonic acid (4:2 FTS)	757124-72-4	0.5 µg/L	96.8	50	130
		EP231X: 6:2 Fluorotelomer sulfonic acid (6:2 FTS)	27619-97-2	0.5 µg/L	90.2	50	130
		EP231X: 8:2 Fluorotelomer sulfonic acid (8:2 FTS)	39108-34-4	0.5 µg/L	114	50	130
		EP231X: 10:2 Fluorotelomer sulfonic acid (10:2 FTS)	120226-60-0	0.5 µg/L	98.8	50	130

ALS Environmental

QA/QC Compliance Assessment to assist with Quality Review

Work Order	: **ES1706190**	Page	: 1 of 15
Client	: **GHD PTY LTD**	Laboratory	: Environmental Division Sydney
Contact	: MR BEN ANDERSON	Telephone	: +61-2-8784 8555
Project	: 21-25583-03 ALEXANDRIA	Date Samples Received	: 15-Mar-2017
Site	: ----	Issue Date	: 23-Mar-2017
Sampler	: DYLAN GALT	No. of samples received	: 15
Order number	: ----	No. of samples analysed	: 15

This report is automatically generated by the ALS LIMS through interpretation of the ALS Quality Control Report and several Quality Assurance parameters measured by ALS. This automated reporting highlights any non-conformances, facilitates faster and more accurate data validation and is designed to assist internal expert and external Auditor review. Many components of this report contribute to the overall DQO assessment and reporting for guideline compliance.

Brief method summaries and references are also provided to assist in traceability.

Summary of Outliers

Outliers : Quality Control Samples

This report highlights outliers flagged in the Quality Control (QC) Report.

- **NO Method Blank value outliers occur.**
- **NO Duplicate outliers occur.**
- **NO Laboratory Control outliers occur.**
- **Matrix Spike outliers exist - please see following pages for full details.**
- **For all regular sample matrices, NO surrogate recovery outliers occur.**

Outliers : Analysis Holding Time Compliance

- **Analysis Holding Time Outliers exist - please see following pages for full details.**

Outliers : Frequency of Quality Control Samples

- **Quality Control Sample Frequency Outliers exist - please see following pages for full details.**

Outliers : Quality Control Samples

Duplicates, Method Blanks, Laboratory Control Samples and Matrix Spikes

Matrix: **SOIL**

Compound Group Name	Laboratory Sample ID	Client Sample ID	Analyte	CAS Number	Data	Limits	Comment
Matrix Spike (MS) Recoveries							
EP004: Organic Matter	ES1706078--003	Anonymous	**Total Organic Carbon**	----	Not Determined	----	**MS recovery not determined, background level greater than or equal to 4x spike level.**

Matrix: **WATER**

Compound Group Name	Laboratory Sample ID	Client Sample ID	Analyte	CAS Number	Data	Limits	Comment
Matrix Spike (MS) Recoveries							
ED041G: Sulfate (Turbidimetric) as SO4 2- by DA	ES1706139--001	Anonymous	**Sulfate as SO4 - Turbidimetric**	14808-79-8	Not Determined	----	**MS recovery not determined, background level greater than or equal to 4x spike level.**
EG035F: Dissolved Mercury by FIMS	ES1706089--001	Anonymous	**Mercury**	7439-97-6	47.7 %	70-130%	**Recovery less than lower data quality objective**

Outliers : Analysis Holding Time Compliance

Matrix: **WATER**

Method / Container / Client Sample ID(s)	Extraction / Preparation			Analysis		
	Date extracted	Due for extraction	Days overdue	Date analysed	Due for analysis	Days overdue
EA005P: pH by PC Titrator						
Clear Plastic Bottle - Natural						
SW01, SW02, SW03, SW04, DUP1, SP_450_01	----	----	----	16-Mar-2017	15-Mar-2017	**1**

Outliers : Frequency of Quality Control Samples

Matrix: **WATER**

Quality Control Sample Type / Method	Count		Rate (%)		Quality Control Specification
	QC	Regular	Actual	Expected	
Laboratory Duplicates (DUP)					
PAH/Phenols (GC/MS - SIM)	0	11	0.00	10.00	NEPM 2013 B3 & ALS QC Standard
TRH - Semivolatile Fraction	0	14	0.00	10.00	NEPM 2013 B3 & ALS QC Standard
Matrix Spikes (MS)					
PAH/Phenols (GC/MS - SIM)	0	11	0.00	5.00	NEPM 2013 B3 & ALS QC Standard
TRH - Semivolatile Fraction	0	14	0.00	5.00	NEPM 2013 B3 & ALS QC Standard

Analysis Holding Time Compliance

If samples are identified below as having been analysed or extracted outside of recommended holding times, this should be taken into consideration when interpreting results.

This report summarizes extraction / preparation and analysis times and compares each with ALS recommended holding times (referencing USEPA SW 846, APHA, AS and NEPM) based on the sample container provided. Dates reported represent first date of extraction or analysis and preclude subsequent dilutions and reruns. A listing of breaches (if any) is provided herein.

Holding time for leachate methods (e.g. TCLP) vary according to the analytes reported. Assessment compares the leach date with the shortest analyte holding time for the equivalent soil method. These are: organics 14 days, mercury 28 days & other metals 180 days. A recorded breach does not guarantee a breach for all non-volatile parameters.

Holding times for ***VOC in soils*** vary according to analytes of interest. Vinyl Chloride and Styrene holding time is 7 days; others 14 days. A recorded breach does not guarantee a breach for all VOC analytes and should be verified in case the reported breach is a false positive or Vinyl Chloride and Styrene are not key analytes of interest/concern.

Matrix: **SOIL**

Evaluation: × = Holding time breach ; ✓ = Within holding time.

Method / Container / Client Sample ID(s)	Sample Date	Extraction / Preparation			Analysis		
		Date extracted	Due for extraction	Evaluation	Date analysed	Due for analysis	Evaluation
EA002 : pH (Soils)							
Soil Glass Jar - Unpreserved (EA002)							
SS01 - TCLP LEACHATE, SS02 - TCLP LEACHATE, SS03 - TCLP LEACHATE, DUP1 - TCLP LEACHATE	**15-Mar-2017**	**21-Mar-2017**	22-Mar-2017	✓	**21-Mar-2017**	21-Mar-2017	✓
EA055: Moisture Content							
Soil Glass Jar - Unpreserved (EA055-103)							
SS01 - TCLP LEACHATE, SS02 - TCLP LEACHATE, SS03 - TCLP LEACHATE, DUP1 - TCLP LEACHATE	**15-Mar-2017**	**----**	----	----	**16-Mar-2017**	29-Mar-2017	✓
ED006: Exchangeable Cations on Alkaline Soils							
Soil Glass Jar - Unpreserved (ED006)							
SS01 - TCLP LEACHATE, SS02 - TCLP LEACHATE, SS03 - TCLP LEACHATE, DUP1 - TCLP LEACHATE	**15-Mar-2017**	**22-Mar-2017**	12-Apr-2017	✓	**22-Mar-2017**	12-Apr-2017	✓
ED040S : Soluble Sulfate by ICPAES							
Soil Glass Jar - Unpreserved (ED040S)							
SS01 - TCLP LEACHATE, SS02 - TCLP LEACHATE, SS03 - TCLP LEACHATE, DUP1 - TCLP LEACHATE	**15-Mar-2017**	**21-Mar-2017**	12-Apr-2017	✓	**21-Mar-2017**	18-Apr-2017	✓
ED045G: Chloride by Discrete Analyser							
Soil Glass Jar - Unpreserved (ED045G)							
SS01 - TCLP LEACHATE, SS02 - TCLP LEACHATE, SS03 - TCLP LEACHATE, DUP1 - TCLP LEACHATE	**15-Mar-2017**	**21-Mar-2017**	12-Apr-2017	✓	**21-Mar-2017**	18-Apr-2017	✓
ED093S: Soluble Major Cations							
Soil Glass Jar - Unpreserved (ED093S)							
SS01 - TCLP LEACHATE, SS02 - TCLP LEACHATE, SS03 - TCLP LEACHATE, DUP1 - TCLP LEACHATE	**15-Mar-2017**	**21-Mar-2017**	11-Sep-2017	✓	**21-Mar-2017**	11-Sep-2017	✓
EG005T: Total Metals by ICP-AES							
Soil Glass Jar - Unpreserved (EG005T)							
SS01 - TCLP LEACHATE, SS02 - TCLP LEACHATE, SS03 - TCLP LEACHATE, DUP1 - TCLP LEACHATE	**15-Mar-2017**	**17-Mar-2017**	11-Sep-2017	✓	**18-Mar-2017**	11-Sep-2017	✓
EG035T: Total Recoverable Mercury by FIMS							
Soil Glass Jar - Unpreserved (EG035T)							
SS01 - TCLP LEACHATE, SS02 - TCLP LEACHATE, SS03 - TCLP LEACHATE, DUP1 - TCLP LEACHATE	**15-Mar-2017**	**17-Mar-2017**	12-Apr-2017	✓	**18-Mar-2017**	12-Apr-2017	✓

Matrix: **SOIL**

Evaluation: × = Holding time breach ; ✓ = Within holding time.

Method / Container / Client Sample ID(s)	Sample Date	Extraction / Preparation			Analysis		
		Date extracted	Due for extraction	Evaluation	Date analysed	Due for analysis	Evaluation
EN33: TCLP Leach							
Non-Volatile Leach: 180 day HT (e.g. metals ex.Hg) (EN33a)							
SS01 - TCLP LEACHATE, SS02 - TCLP LEACHATE, SS03 - TCLP LEACHATE, DUP1 - TCLP LEACHATE	**15-Mar-2017**	**16-Mar-2017**	11-Sep-2017	✓	**----**	----	----
EN60: Bottle Leaching Procedure							
Non-Volatile Leach: 180 day HT (e.g. metals ex.Hg) (EN60-DIa)							
SS01 - DI LEACH, SS02 - DI LEACH, SS03 - DI LEACH, DUP1 - DI LEACH	**15-Mar-2017**	**16-Mar-2017**	11-Sep-2017	✓	**----**	----	----
EP004: Organic Matter							
Soil Glass Jar - Unpreserved (EP004)							
SS01 - TCLP LEACHATE, SS02 - TCLP LEACHATE, SS03 - TCLP LEACHATE, DUP1 - TCLP LEACHATE	**15-Mar-2017**	**20-Mar-2017**	12-Apr-2017	✓	**20-Mar-2017**	12-Apr-2017	✓
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons							
Soil Glass Jar - Unpreserved (EP075(SIM))							
SS01 - TCLP LEACHATE, SS02 - TCLP LEACHATE, SS03 - TCLP LEACHATE, DUP1 - TCLP LEACHATE	**15-Mar-2017**	**17-Mar-2017**	29-Mar-2017	✓	**17-Mar-2017**	26-Apr-2017	✓
EP080/071: Total Petroleum Hydrocarbons							
Soil Glass Jar - Unpreserved (EP071)							
SS01 - TCLP LEACHATE, SS02 - TCLP LEACHATE, SS03 - TCLP LEACHATE, DUP1 - TCLP LEACHATE	**15-Mar-2017**	**17-Mar-2017**	29-Mar-2017	✓	**17-Mar-2017**	26-Apr-2017	✓
Soil Glass Jar - Unpreserved (EP080)							
SS01 - TCLP LEACHATE, SS02 - TCLP LEACHATE, SS03 - TCLP LEACHATE, DUP1 - TCLP LEACHATE	**15-Mar-2017**	**17-Mar-2017**	29-Mar-2017	✓	**20-Mar-2017**	29-Mar-2017	✓
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions							
Soil Glass Jar - Unpreserved (EP071)							
SS01 - TCLP LEACHATE, SS02 - TCLP LEACHATE, SS03 - TCLP LEACHATE, DUP1 - TCLP LEACHATE	**15-Mar-2017**	**17-Mar-2017**	29-Mar-2017	✓	**17-Mar-2017**	26-Apr-2017	✓
Soil Glass Jar - Unpreserved (EP080)							
SS01 - TCLP LEACHATE, SS02 - TCLP LEACHATE, SS03 - TCLP LEACHATE, DUP1 - TCLP LEACHATE	**15-Mar-2017**	**17-Mar-2017**	29-Mar-2017	✓	**20-Mar-2017**	29-Mar-2017	✓
EP080: BTEXN							
Soil Glass Jar - Unpreserved (EP080)							
SS01 - TCLP LEACHATE, SS02 - TCLP LEACHATE, SS03 - TCLP LEACHATE, DUP1 - TCLP LEACHATE	**15-Mar-2017**	**17-Mar-2017**	29-Mar-2017	✓	**20-Mar-2017**	29-Mar-2017	✓
EP231A: Perfluoroalkyl Sulfonic Acids							
HDPE Soil Jar (EP231X)							
SS01 - TCLP LEACHATE, SS02 - TCLP LEACHATE, SS03 - TCLP LEACHATE, DUP1 - TCLP LEACHATE	**15-Mar-2017**	**20-Mar-2017**	11-Sep-2017	✓	**20-Mar-2017**	29-Apr-2017	✓
EP231B: Perfluoroalkyl Carboxylic Acids							
HDPE Soil Jar (EP231X)							
SS01 - TCLP LEACHATE, SS02 - TCLP LEACHATE, SS03 - TCLP LEACHATE, DUP1 - TCLP LEACHATE	**15-Mar-2017**	**20-Mar-2017**	11-Sep-2017	✓	**20-Mar-2017**	29-Apr-2017	✓

Matrix: **SOIL**

Evaluation: × = Holding time breach ; ✓ = Within holding time.

Method / Container / Client Sample ID(s)	Sample Date	Extraction / Preparation			Analysis		
		Date extracted	Due for extraction	Evaluation	Date analysed	Due for analysis	Evaluation
EP231C: Perfluoroalkyl Sulfonamides							
HDPE Soil Jar (EP231X)							
SS01 - TCLP LEACHATE, SS02 - TCLP LEACHATE, SS03 - TCLP LEACHATE, DUP1 - TCLP LEACHATE	**15-Mar-2017**	**20-Mar-2017**	11-Sep-2017	✓	**20-Mar-2017**	29-Apr-2017	✓
EP231D: (n:2) Fluorotelomer Sulfonic Acids							
HDPE Soil Jar (EP231X)							
SS01 - TCLP LEACHATE, SS02 - TCLP LEACHATE, SS03 - TCLP LEACHATE, DUP1 - TCLP LEACHATE	**15-Mar-2017**	**20-Mar-2017**	11-Sep-2017	✓	**20-Mar-2017**	29-Apr-2017	✓
EP231P: PFAS Sums							
HDPE Soil Jar (EP231X)							
SS01 - TCLP LEACHATE, SS02 - TCLP LEACHATE, SS03 - TCLP LEACHATE, DUP1 - TCLP LEACHATE	**15-Mar-2017**	**20-Mar-2017**	11-Sep-2017	✓	**20-Mar-2017**	29-Apr-2017	✓

Matrix: **WATER**

Evaluation: × = Holding time breach ; ✓ = Within holding time.

Method / Container / Client Sample ID(s)	Sample Date	Extraction / Preparation			Analysis		
		Date extracted	Due for extraction	Evaluation	Date analysed	Due for analysis	Evaluation
EA005P: pH by PC Titrator							
Clear Plastic Bottle - Natural (EA005-P)							
SW01, SW02, SW03, SW04, DUP1, SP_450_01	**15-Mar-2017**	**----**	----	----	**16-Mar-2017**	15-Mar-2017	×
EA015: Total Dissolved Solids dried at 180 ± 5 °C							
Clear Plastic Bottle - Natural (EA015H)							
SW01, SW02, SW03, SW04, DUP1, SP_450_01	**15-Mar-2017**	**----**	----	----	**17-Mar-2017**	22-Mar-2017	✓
ED037P: Alkalinity by PC Titrator							
Clear Plastic Bottle - Natural (ED037-P)							
SW01, SW02, SW03, SW04, DUP1, SP_450_01	**15-Mar-2017**	**----**	----	----	**16-Mar-2017**	29-Mar-2017	✓
ED041G: Sulfate (Turbidimetric) as SO4 2- by DA							
Clear Plastic Bottle - Natural (ED041G)							
SW01, SW02, SW03, SW04, DUP1, SP_450_01	**15-Mar-2017**	**----**	----	----	**16-Mar-2017**	12-Apr-2017	✓
ED045G: Chloride by Discrete Analyser							
Clear Plastic Bottle - Natural (ED045G)							
SW01, SW02, SW03, SW04, DUP1, SP_450_01	**15-Mar-2017**	**----**	----	----	**16-Mar-2017**	12-Apr-2017	✓

Matrix: **WATER**

Evaluation: × = Holding time breach ; ✓ = Within holding time.

Method / Container / Client Sample ID(s)	Sample Date	Extraction / Preparation			Analysis		
		Date extracted	Due for extraction	Evaluation	Date analysed	Due for analysis	Evaluation
ED093F: Dissolved Major Cations							
Clear Plastic Bottle - Natural (ED093F)							
SP_450_01	**15-Mar-2017**	**----**	----	----	**17-Mar-2017**	22-Mar-2017	✓
Clear Plastic Bottle - Nitric Acid; Filtered (ED093F)							
SW01, SW02, SW03, SW04, DUP1	**15-Mar-2017**	**----**	----	----	**20-Mar-2017**	12-Apr-2017	✓
EG020F: Dissolved Metals by ICP-MS							
Clear Plastic Bottle - Nitric Acid; Filtered (EG020A-F)							
SW01, SW02, SW03, SW04, DUP1	**15-Mar-2017**	**----**	----	----	**20-Mar-2017**	11-Sep-2017	✓
EG020T: Total Metals by ICP-MS							
Clear Plastic Bottle - Nitric Acid; Unfiltered (EG020A-T)							
SW01, SW02, SW03, SW04, DUP1	**15-Mar-2017**	**20-Mar-2017**	11-Sep-2017	✓	**20-Mar-2017**	11-Sep-2017	✓
EG035F: Dissolved Mercury by FIMS							
Clear Plastic Bottle - Nitric Acid; Filtered (EG035F)							
SW01, SW02, SW03, SW04, DUP1	**15-Mar-2017**	**----**	----	----	**20-Mar-2017**	12-Apr-2017	✓
EG035T: Total Recoverable Mercury by FIMS							
Clear Plastic Bottle - Nitric Acid; Unfiltered (EG035T)							
SW01, SW02, SW03, SW04, DUP1	**15-Mar-2017**	**----**	----	----	**21-Mar-2017**	12-Apr-2017	✓
EP005: Total Organic Carbon (TOC)							
Amber TOC Vial - Sulfuric Acid (EP005)							
SW01, SW02, SW03, SW04, DUP1	**15-Mar-2017**	**----**	----	----	**20-Mar-2017**	12-Apr-2017	✓
Clear Plastic Bottle - Natural (EP005)							
SP_450_01	**15-Mar-2017**	**----**	----	----	**16-Mar-2017**	16-Mar-2017	✓
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons							
Amber Glass Bottle - Unpreserved (EP075(SIM))							
SW01, SW02, SW03, SW04, DUP1	**15-Mar-2017**	**16-Mar-2017**	22-Mar-2017	✓	**17-Mar-2017**	25-Apr-2017	✓

Matrix: **WATER**

Evaluation: × = Holding time breach ; ✓ = Within holding time.

Method / Container / Client Sample ID(s)	Sample Date	Extraction / Preparation			Analysis		
		Date extracted	Due for extraction	Evaluation	Date analysed	Due for analysis	Evaluation
EP080/071: Total Petroleum Hydrocarbons							
Amber Glass Bottle - Unpreserved (EP071)							
SW01, SW02, SW03, SW04, DUP1	**15-Mar-2017**	**16-Mar-2017**	22-Mar-2017	✓	**17-Mar-2017**	25-Apr-2017	✓
Amber VOC Vial - Sulfuric Acid (EP080)							
SW01, SW02, SW03, SW04, DUP1	**15-Mar-2017**	**17-Mar-2017**	29-Mar-2017	✓	**17-Mar-2017**	29-Mar-2017	✓
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions							
Amber Glass Bottle - Unpreserved (EP071)							
SW01, SW02, SW03, SW04, DUP1	**15-Mar-2017**	**16-Mar-2017**	22-Mar-2017	✓	**17-Mar-2017**	25-Apr-2017	✓
Amber VOC Vial - Sulfuric Acid (EP080)							
SW01, SW02, SW03, SW04, DUP1	**15-Mar-2017**	**17-Mar-2017**	29-Mar-2017	✓	**17-Mar-2017**	29-Mar-2017	✓
EP080: BTEXN							
Amber VOC Vial - Sulfuric Acid (EP080)							
SW01, SW02, SW03, SW04, DUP1, TS	**15-Mar-2017**	**17-Mar-2017**	29-Mar-2017	✓	**17-Mar-2017**	29-Mar-2017	✓
EP231A: Perfluoroalkyl Sulfonic Acids							
HDPE (no PTFE) (EP231X)							
SW01, SW02, SW03, SW04, DUP1, SP_450_01	**15-Mar-2017**	**----**	----	----	**17-Mar-2017**	11-Sep-2017	✓
HDPE (no PTFE) (EP231X)							
SS01 - TCLP LEACHATE, SS02 - TCLP LEACHATE, SS03 - TCLP LEACHATE, DUP1 - TCLP LEACHATE, SS01 - DI LEACH, SS02 - DI LEACH, SS03 - DI LEACH, DUP1 - DI LEACH	**16-Mar-2017**	**----**	----	----	**20-Mar-2017**	12-Sep-2017	✓
EP231B: Perfluoroalkyl Carboxylic Acids							
HDPE (no PTFE) (EP231X)							
SW01, SW02, SW03, SW04, DUP1, SP_450_01	**15-Mar-2017**	**----**	----	----	**17-Mar-2017**	11-Sep-2017	✓
HDPE (no PTFE) (EP231X)							
SS01 - TCLP LEACHATE, SS02 - TCLP LEACHATE, SS03 - TCLP LEACHATE, DUP1 - TCLP LEACHATE, SS01 - DI LEACH, SS02 - DI LEACH, SS03 - DI LEACH, DUP1 - DI LEACH	**16-Mar-2017**	**----**	----	----	**20-Mar-2017**	12-Sep-2017	✓

Matrix: **WATER**

Evaluation: × = Holding time breach ; ✓ = Within holding time.

Method / Container / Client Sample ID(s)	Sample Date	Extraction / Preparation			Analysis		
		Date extracted	Due for extraction	Evaluation	Date analysed	Due for analysis	Evaluation
EP231C: Perfluoroalkyl Sulfonamides							
HDPE (no PTFE) (EP231X)							
SW01, SW02, SW03, SW04, DUP1, SP_450_01	**15-Mar-2017**	**----**	----	----	**17-Mar-2017**	11-Sep-2017	✓
HDPE (no PTFE) (EP231X)							
SS01 - TCLP LEACHATE, SS02 - TCLP LEACHATE, SS03 - TCLP LEACHATE, DUP1 - TCLP LEACHATE, SS01 - DI LEACH, SS02 - DI LEACH, SS03 - DI LEACH, DUP1 - DI LEACH	**16-Mar-2017**	**----**	----	----	**20-Mar-2017**	12-Sep-2017	✓
EP231D: (n:2) Fluorotelomer Sulfonic Acids							
HDPE (no PTFE) (EP231X)							
SW01, SW02, SW03, SW04, DUP1, SP_450_01	**15-Mar-2017**	**----**	----	----	**17-Mar-2017**	11-Sep-2017	✓
HDPE (no PTFE) (EP231X)							
SS01 - TCLP LEACHATE, SS02 - TCLP LEACHATE, SS03 - TCLP LEACHATE, DUP1 - TCLP LEACHATE, SS01 - DI LEACH, SS02 - DI LEACH, SS03 - DI LEACH, DUP1 - DI LEACH	**16-Mar-2017**	**----**	----	----	**20-Mar-2017**	12-Sep-2017	✓
EP231P: PFAS Sums							
HDPE (no PTFE) (EP231X)							
SW01, SW02, SW03, SW04, DUP1, SP_450_01	**15-Mar-2017**	**----**	----	----	**17-Mar-2017**	11-Sep-2017	✓
HDPE (no PTFE) (EP231X)							
SS01 - TCLP LEACHATE, SS02 - TCLP LEACHATE, SS03 - TCLP LEACHATE, DUP1 - TCLP LEACHATE, SS01 - DI LEACH, SS02 - DI LEACH, SS03 - DI LEACH, DUP1 - DI LEACH	**16-Mar-2017**	**----**	----	----	**20-Mar-2017**	12-Sep-2017	✓

Quality Control Parameter Frequency Compliance

The following report summarises the frequency of laboratory QC samples analysed within the analytical lot(s) in which the submitted sample(s) was(were) processed. Actual rate should be greater than or equal to the expected rate. A listing of breaches is provided in the Summary of Outliers.

Matrix: **SOIL**

Evaluation: × = Quality Control frequency not within specification ; ✓ = Quality Control frequency within specification.

Quality Control Sample Type		Count		Rate (%)			Quality Control Specification
Analytical Methods	*Method*	*QC*	*Regular*	***Actual***	***Expected***	*Evaluation*	
Laboratory Duplicates (DUP)							
Cations - soluble by ICP-AES	ED093S	1	10	**10.00**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Chloride Soluble By Discrete Analyser	ED045G	2	20	**10.00**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Exchangeable Cations on Alkaline Soils	ED006	1	4	**25.00**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Major Anions - Soluble	ED040S	2	20	**10.00**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Moisture Content	EA055-103	2	20	**10.00**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Organic Matter	EP004	2	13	**15.38**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
PAH/Phenols (SIM)	EP075(SIM)	2	19	**10.53**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Per- and Polyfluoroalkyl Substances (PFAS) by LCMSMS	EP231X	1	6	**16.67**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
pH (1:5)	EA002	1	10	**10.00**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Total Mercury by FIMS	EG035T	2	18	**11.11**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Total Metals by ICP-AES	EG005T	2	18	**11.11**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
TRH - Semivolatile Fraction	EP071	2	19	**10.53**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
TRH Volatiles/BTEX	EP080	2	20	**10.00**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Laboratory Control Samples (LCS)							
Cations - soluble by ICP-AES	ED093S	1	10	**10.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Chloride Soluble By Discrete Analyser	ED045G	2	20	**10.00**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Exchangeable Cations on Alkaline Soils	ED006	1	4	**25.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Major Anions - Soluble	ED040S	1	20	**5.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Organic Matter	EP004	1	13	**7.69**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
PAH/Phenols (SIM)	EP075(SIM)	1	19	**5.26**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Per- and Polyfluoroalkyl Substances (PFAS) by LCMSMS	EP231X	1	6	**16.67**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Total Mercury by FIMS	EG035T	1	18	**5.56**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Total Metals by ICP-AES	EG005T	1	18	**5.56**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
TRH - Semivolatile Fraction	EP071	1	19	**5.26**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
TRH Volatiles/BTEX	EP080	1	20	**5.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Method Blanks (MB)							
Cations - soluble by ICP-AES	ED093S	1	10	**10.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Chloride Soluble By Discrete Analyser	ED045G	1	20	**5.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Exchangeable Cations on Alkaline Soils	ED006	1	4	**25.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Major Anions - Soluble	ED040S	1	20	**5.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Organic Matter	EP004	1	13	**7.69**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
PAH/Phenols (SIM)	EP075(SIM)	1	19	**5.26**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Per- and Polyfluoroalkyl Substances (PFAS) by LCMSMS	EP231X	1	6	**16.67**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
TCLP for Non & Semivolatile Analytes	EN33a	1	4	**25.00**	**9.09**	✓	NEPM 2013 B3 & ALS QC Standard
Total Mercury by FIMS	EG035T	1	18	**5.56**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Total Metals by ICP-AES	EG005T	1	18	**5.56**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard

Matrix: **SOIL**

Evaluation: × = Quality Control frequency not within specification ; ✓ = Quality Control frequency within specification.

Quality Control Sample Type		Count		Rate (%)			Quality Control Specification
Analytical Methods	Method	QC	Regular	Actual	Expected	Evaluation	
Method Blanks (MB) - Continued							
TRH - Semivolatile Fraction	EP071	1	19	**5.26**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
TRH Volatiles/BTEX	EP080	1	20	**5.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Matrix Spikes (MS)							
Chloride Soluble By Discrete Analyser	ED045G	1	20	**5.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Organic Matter	EP004	1	13	**7.69**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
PAH/Phenols (SIM)	EP075(SIM)	1	19	**5.26**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Per- and Polyfluoroalkyl Substances (PFAS) by LCMSMS	EP231X	1	6	**16.67**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Total Mercury by FIMS	EG035T	1	18	**5.56**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Total Metals by ICP-AES	EG005T	1	18	**5.56**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
TRH - Semivolatile Fraction	EP071	1	19	**5.26**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
TRH Volatiles/BTEX	EP080	1	20	**5.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard

Matrix: **WATER**

Evaluation: × = Quality Control frequency not within specification ; ✓ = Quality Control frequency within specification.

Quality Control Sample Type		Count		Rate (%)			Quality Control Specification
Analytical Methods	Method	QC	Regular	Actual	Expected	Evaluation	
Laboratory Duplicates (DUP)							
Alkalinity by PC Titrator	ED037-P	2	20	**10.00**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Chloride by Discrete Analyser	ED045G	2	20	**10.00**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Dissolved Mercury by FIMS	EG035F	2	9	**22.22**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Dissolved Metals by ICP-MS - Suite A	EG020A-F	2	20	**10.00**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Major Cations - Dissolved	ED093F	3	23	**13.04**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
PAH/Phenols (GC/MS - SIM)	EP075(SIM)	0	11	**0.00**	**10.00**	×	NEPM 2013 B3 & ALS QC Standard
Per- and Polyfluoroalkyl Substances (PFAS) by LCMSMS	EP231X	3	28	**10.71**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
pH by PC Titrator	EA005-P	2	20	**10.00**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Sulfate (Turbidimetric) as SO4 2- by Discrete Analyser	ED041G	2	16	**12.50**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Total Dissolved Solids (High Level)	EA015H	2	18	**11.11**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Total Mercury by FIMS	EG035T	2	18	**11.11**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Total Metals by ICP-MS - Suite A	EG020A-T	2	10	**20.00**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Total Organic Carbon	EP005	4	39	**10.26**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
TRH - Semivolatile Fraction	EP071	0	14	**0.00**	**10.00**	×	NEPM 2013 B3 & ALS QC Standard
TRH Volatiles/BTEX	EP080	2	20	**10.00**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Laboratory Control Samples (LCS)							
Alkalinity by PC Titrator	ED037-P	1	20	**5.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Chloride by Discrete Analyser	ED045G	2	20	**10.00**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Dissolved Mercury by FIMS	EG035F	1	9	**11.11**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Dissolved Metals by ICP-MS - Suite A	EG020A-F	1	20	**5.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Major Cations - Dissolved	ED093F	2	23	**8.70**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
PAH/Phenols (GC/MS - SIM)	EP075(SIM)	1	11	**9.09**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Per- and Polyfluoroalkyl Substances (PFAS) by LCMSMS	EP231X	2	28	**7.14**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Sulfate (Turbidimetric) as SO4 2- by Discrete Analyser	ED041G	1	16	**6.25**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard

Matrix: **WATER**

Evaluation: × = Quality Control frequency not within specification ; ✓ = Quality Control frequency within specification.

Quality Control Sample Type		Count		Rate (%)			Quality Control Specification
Analytical Methods	*Method*	*QC*	*Regular*	***Actual***	***Expected***	*Evaluation*	
Laboratory Control Samples (LCS) - Continued							
Total Dissolved Solids (High Level)	EA015H	2	18	**11.11**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Total Mercury by FIMS	EG035T	1	18	**5.56**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Total Metals by ICP-MS - Suite A	EG020A-T	1	10	**10.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Total Organic Carbon	EP005	2	39	**5.13**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
TRH - Semivolatile Fraction	EP071	1	14	**7.14**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
TRH Volatiles/BTEX	EP080	1	20	**5.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Method Blanks (MB)							
Chloride by Discrete Analyser	ED045G	1	20	**5.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Dissolved Mercury by FIMS	EG035F	1	9	**11.11**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Dissolved Metals by ICP-MS - Suite A	EG020A-F	1	20	**5.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Major Cations - Dissolved	ED093F	2	23	**8.70**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
PAH/Phenols (GC/MS - SIM)	EP075(SIM)	1	11	**9.09**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Per- and Polyfluoroalkyl Substances (PFAS) by LCMSMS	EP231X	2	28	**7.14**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Sulfate (Turbidimetric) as SO4 2- by Discrete Analyser	ED041G	1	16	**6.25**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Total Dissolved Solids (High Level)	EA015H	1	18	**5.56**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Total Mercury by FIMS	EG035T	1	18	**5.56**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Total Metals by ICP-MS - Suite A	EG020A-T	1	10	**10.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Total Organic Carbon	EP005	2	39	**5.13**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
TRH - Semivolatile Fraction	EP071	1	14	**7.14**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
TRH Volatiles/BTEX	EP080	1	20	**5.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Matrix Spikes (MS)							
Chloride by Discrete Analyser	ED045G	1	20	**5.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Dissolved Mercury by FIMS	EG035F	1	9	**11.11**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Dissolved Metals by ICP-MS - Suite A	EG020A-F	1	20	**5.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
PAH/Phenols (GC/MS - SIM)	EP075(SIM)	0	11	**0.00**	**5.00**	×	NEPM 2013 B3 & ALS QC Standard
Per- and Polyfluoroalkyl Substances (PFAS) by LCMSMS	EP231X	2	28	**7.14**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Sulfate (Turbidimetric) as SO4 2- by Discrete Analyser	ED041G	1	16	**6.25**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Total Mercury by FIMS	EG035T	1	18	**5.56**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Total Metals by ICP-MS - Suite A	EG020A-T	1	10	**10.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Total Organic Carbon	EP005	2	39	**5.13**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
TRH - Semivolatile Fraction	EP071	0	14	**0.00**	**5.00**	×	NEPM 2013 B3 & ALS QC Standard
TRH Volatiles/BTEX	EP080	1	20	**5.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard

Brief Method Summaries

The analytical procedures used by the Environmental Division have been developed from established internationally recognized procedures such as those published by the US EPA, APHA, AS and NEPM. In house developed procedures are employed in the absence of documented standards or by client request. The following report provides brief descriptions of the analytical procedures employed for results reported in the Certificate of Analysis. Sources from which ALS methods have been developed are provided within the Method Descriptions.

Analytical Methods	Method	Matrix	Method Descriptions
pH (1:5)	EA002	SOIL	In house: Referenced to APHA 4500H+. pH is determined on soil samples after a 1:5 soil/water leach. This method is compliant with NEPM (2013) Schedule B(3) (Method 103)
Moisture Content	EA055-103	SOIL	In house: A gravimetric procedure based on weight loss over a 12 hour drying period at 103-105 degrees C. This method is compliant with NEPM (2013) Schedule B(3) Section 7.1 and Table 1 (14 day holding time).
Exchangeable Cations on Alkaline Soils	ED006	SOIL	In house: Referenced to Soil Survey Test Method C5. Soluble salts are removed from the sample prior to analysis. Cations are exchanged from the sample by contact with alcoholic ammonium chloride at pH 8.5. They are then quantitated in the final solution by ICPAES and reported as meq/100g of original soil.
Major Anions - Soluble	ED040S	SOIL	In house: Soluble Anions are determined off a 1:5 soil / water extract by ICPAES.
Chloride Soluble By Discrete Analyser	ED045G	SOIL	In house: Referenced to APHA 4500-Cl- E. The thiocyanate ion is liberated from mercuric thiocyanate through sequestration of mercury by the chloride ion to form non-ionised mercuric chloride.in the presence of ferric ions the librated thiocynate forms highly-coloured ferric thiocynate which is measured at 480 nm. Analysis is performed on a 1:5 soil / water leachate.
Cations - soluble by ICP-AES	ED093S	SOIL	In house: Referenced to APHA 3120; USEPA SW 846 - 6010 (ICPAES) Water extracts of the soil are analyzed for major cations by ICPAES. The ICPAES technique ionises samples in a plasma, emitting a characteristic spectrum based on metals present. Intensities at selected wavelengths are compared against those of matrix matched standards. This method is compliant with NEPM (2013) Schedule B(3)
Total Metals by ICP-AES	EG005T	SOIL	In house: Referenced to APHA 3120; USEPA SW 846 - 6010. Metals are determined following an appropriate acid digestion of the soil. The ICPAES technique ionises samples in a plasma, emitting a characteristic spectrum based on metals present. Intensities at selected wavelengths are compared against those of matrix matched standards. This method is compliant with NEPM (2013) Schedule B(3)
Total Mercury by FIMS	EG035T	SOIL	In house: Referenced to AS 3550, APHA 3112 Hg - B (Flow-injection (SnCl2)(Cold Vapour generation) AAS) FIM-AAS is an automated flameless atomic absorption technique. Mercury in solids are determined following an appropriate acid digestion. Ionic mercury is reduced online to atomic mercury vapour by SnCl2 which is then purged into a heated quartz cell. Quantification is by comparing absorbance against a calibration curve. This method is compliant with NEPM (2013) Schedule B(3)
Organic Matter	EP004	SOIL	In house: Referenced to AS1289.4.1.1 - 1997., Dichromate oxidation method after Walkley and Black. This method is compliant with NEPM (2013) Schedule B(3)
TRH - Semivolatile Fraction	EP071	SOIL	In house: Referenced to USEPA SW 846 - 8015A Sample extracts are analysed by Capillary GC/FID and quantified against alkane standards over the range C10 - C40.
PAH/Phenols (SIM)	EP075(SIM)	SOIL	In house: Referenced to USEPA SW 846 - 8270D Extracts are analysed by Capillary GC/MS in Selective Ion Mode (SIM) and quantification is by comparison against an established 5 point calibration curve. This method is compliant with NEPM (2013) Schedule B(3) (Method 502 and 507)
TRH Volatiles/BTEX	EP080	SOIL	In house: Referenced to USEPA SW 846 - 8260B Extracts are analysed by Purge and Trap, Capillary GC/MS. Quantification is by comparison against an established 5 point calibration curve.
Per- and Polyfluoroalkyl Substances (PFAS) by LCMSMS	EP231X	SOIL	In house: Direct injection analysis of fresh waters after dilution (1:1) with methanol. Analysis by LC-Electrospray-MS-MS, Negative Mode using MRM. PFOS is quantified using a certified, traceable standard consisting of linear and branched PFOS isomers.

Analytical Methods	Method	Matrix	Method Descriptions
pH by PC Titrator	EA005-P	WATER	In house: Referenced to APHA 4500 H+ B. This procedure determines pH of water samples by automated ISE. This method is compliant with NEPM (2013) Schedule B(3)
Total Dissolved Solids (High Level)	EA015H	WATER	In house: Referenced to APHA 2540C. A gravimetric procedure that determines the amount of `filterable` residue in an aqueous sample. A well-mixed sample is filtered through a glass fibre filter (1.2um). The filtrate is evaporated to dryness and dried to constant weight at 180+/-5C. This method is compliant with NEPM (2013) Schedule B(3)
Alkalinity by PC Titrator	ED037-P	WATER	In house: Referenced to APHA 2320 B This procedure determines alkalinity by automated measurement (e.g. PC Titrate) using pH 4.5 for indicating the total alkalinity end-point. This method is compliant with NEPM (2013) Schedule B(3)
Sulfate (Turbidimetric) as SO4 2- by Discrete Analyser	ED041G	WATER	In house: Referenced to APHA 4500-SO4. Dissolved sulfate is determined in a 0.45um filtered sample. Sulfate ions are converted to a barium sulfate suspension in an acetic acid medium with barium chloride. Light absorbance of the BaSO4 suspension is measured by a photometer and the SO4-2 concentration is determined by comparison of the reading with a standard curve. This method is compliant with NEPM (2013) Schedule B(3)
Chloride by Discrete Analyser	ED045G	WATER	In house: Referenced to APHA 4500 Cl - G.The thiocyanate ion is liberated from mercuric thiocyanate through sequestration of mercury by the chloride ion to form non-ionised mercuric chloride.in the presence of ferric ions the librated thiocynate forms highly-coloured ferric thiocynate which is measured at 480 nm APHA 21st edition seal method 2 017-1-L april 2003
Major Cations - Dissolved	ED093F	WATER	In house: Referenced to APHA 3120 and 3125; USEPA SW 846 - 6010 and 6020; Cations are determined by either ICP-AES or ICP-MS techniques. This method is compliant with NEPM (2013) Schedule B(3) Sodium Adsorption Ratio is calculated from Ca, Mg and Na which determined by ALS in house method QWI-EN/ED093F. This method is compliant with NEPM (2013) Schedule B(3) Hardness parameters are calculated based on APHA 2340 B. This method is compliant with NEPM (2013) Schedule B(3)
Dissolved Metals by ICP-MS - Suite A	EG020A-F	WATER	In house: Referenced to APHA 3125; USEPA SW846 - 6020, ALS QWI-EN/EG020. Samples are 0.45µm filtered prior to analysis. The ICPMS technique utilizes a highly efficient argon plasma to ionize selected elements. Ions are then passed into a high vacuum mass spectrometer, which separates the analytes based on their distinct mass to charge ratios prior to their measurement by a discrete dynode ion detector.
Total Metals by ICP-MS - Suite A	EG020A-T	WATER	In house: Referenced to APHA 3125; USEPA SW846 - 6020, ALS QWI-EN/EG020. The ICPMS technique utilizes a highly efficient argon plasma to ionize selected elements. Ions are then passed into a high vacuum mass spectrometer, which separates the analytes based on their distinct mass to charge ratios prior to their measurement by a discrete dynode ion detector.
Dissolved Mercury by FIMS	EG035F	WATER	In house: Referenced to AS 3550, APHA 3112 Hg - B (Flow-injection (SnCl2)(Cold Vapour generation) AAS) Samples are 0.45µm filtered prior to analysis. FIM-AAS is an automated flameless atomic absorption technique. A bromate/bromide reagent is used to oxidise any organic mercury compounds in the filtered sample. The ionic mercury is reduced online to atomic mercury vapour by SnCl2 which is then purged into a heated quartz cell. Quantification is by comparing absorbance against a calibration curve. This method is compliant with NEPM (2013) Schedule B(3)

Analytical Methods	Method	Matrix	Method Descriptions
Total Mercury by FIMS	EG035T	WATER	In house: Referenced to AS 3550, APHA 3112 Hg - B (Flow-injection (SnCl2)(Cold Vapour generation) AAS) FIM-AAS is an automated flameless atomic absorption technique. A bromate/bromide reagent is used to oxidise any organic mercury compounds in the unfiltered sample. The ionic mercury is reduced online to atomic mercury vapour by SnCl2 which is then purged into a heated quartz cell. Quantification is by comparing absorbance against a calibration curve. This method is compliant with NEPM (2013) Schedule B(3)
Ionic Balance by PCT DA and Turbi SO4 DA	EN055 - PG	WATER	In house: Referenced to APHA 1030F. This method is compliant with NEPM (2013) Schedule B(3)
Total Organic Carbon	EP005	WATER	In house: Referenced to APHA 5310 B, The automated TOC analyzer determines Total and Inorganic Carbon by IR cell. TOC is calculated as the difference. This method is compliant with NEPM (2013) Schedule B(3)
TRH - Semivolatile Fraction	EP071	WATER	In house: Referenced to USEPA SW 846 - 8015A The sample extract is analysed by Capillary GC/FID and quantification is by comparison against an established 5 point calibration curve of n-Alkane standards. This method is compliant with the QC requirements of NEPM (2013) Schedule B(3)
PAH/Phenols (GC/MS - SIM)	EP075(SIM)	WATER	In house: Referenced to USEPA SW 846 - 8270D Sample extracts are analysed by Capillary GC/MS in SIM Mode and quantification is by comparison against an established 5 point calibration curve. This method is compliant with NEPM (2013) Schedule B(3)
TRH Volatiles/BTEX	EP080	WATER	In house: Referenced to USEPA SW 846 - 8260B Water samples are directly purged prior to analysis by Capillary GC/MS and quantification is by comparison against an established 5 point calibration curve. Alternatively, a sample is equilibrated in a headspace vial and a portion of the headspace determined by GCMS analysis. This method is compliant with the QC requirements of NEPM (2013) Schedule B(3)
Per- and Polyfluoroalkyl Substances (PFAS) by LCMSMS	EP231X	WATER	In house: Direct injection analysis of fresh waters after dilution (1:1) with methanol. Analysis by LC-Electrospray-MS-MS, Negative Mode using MRM. PFOS is quantified using a certified, traceable standard consisting of linear and branched PFOS isomers.

Preparation Methods	Method	Matrix	Method Descriptions
Exchangeable Cations Preparation Method (Alkaline Soils)	ED006PR	SOIL	In house: Referenced to Rayment and Lyons 2011 method 15C1.
Exchangeable Cations Preparation Method	ED007PR	SOIL	In house: Referenced to Rayment & Higginson (1992) method 15A1. A 1M NH4Cl extraction by end over end tumbling at a ratio of 1:20. There is no pretreatment for soluble salts. Extracts can be run by ICP for cations.
TCLP for Non & Semivolatile Analytes	EN33a	SOIL	In house QWI-EN/33 referenced to USEPA SW846-1311: The TCLP procedure is designed to determine the mobility of both organic and inorganic analytes present in wastes. The standard TCLP leach is for non-volatile and Semivolatile test parameters.
1:5 solid / water leach for soluble analytes	EN34	SOIL	10 g of soil is mixed with 50 mL of distilled water and tumbled end over end for 1 hour. Water soluble salts are leached from the soil by the continuous suspension. Samples are settled and the water filtered off for analysis.
Deionised Water Leach	EN60-Dla	SOIL	In house QWI-EN/60 referenced to AS4439.3 Preparation of Leachates
Hot Block Digest for metals in soils sediments and sludges	EN69	SOIL	In house: Referenced to USEPA 200.2. Hot Block Acid Digestion 1.0g of sample is heated with Nitric and Hydrochloric acids, then cooled. Peroxide is added and samples heated and cooled again before being filtered and bulked to volume for analysis. Digest is appropriate for determination of selected metals in sludge, sediments, and soils. This method is compliant with NEPM (2013) Schedule B(3) (Method 202)
Organic Matter	EP004-PR	SOIL	In house: Referenced to AS1289.4.1.1 - 1997. Dichromate oxidation method after Walkley and Black. This method is compliant with NEPM (2013) Schedule B(3) (Method 105)
Sample Extraction for PFAS	EP231-PR	SOIL	In house

Preparation Methods	Method	Matrix	Method Descriptions
Methanolic Extraction of Soils for Purge and Trap	* ORG16	SOIL	In house: Referenced to USEPA SW 846 - 5030A. 5g of solid is shaken with surrogate and 10mL methanol prior to analysis by Purge and Trap - GC/MS.
Tumbler Extraction of Solids	ORG17	SOIL	In house: Mechanical agitation (tumbler). 10g of sample, Na2SO4 and surrogate are extracted with 30mL 1:1 DCM/Acetone by end over end tumble. The solvent is decanted, dehydrated and concentrated (by KD) to the desired volume for analysis.
Digestion for Total Recoverable Metals	EN25	WATER	In house: Referenced to USEPA SW846-3005. Method 3005 is a Nitric/Hydrochloric acid digestion procedure used to prepare surface and ground water samples for analysis by ICPAES or ICPMS. This method is compliant with NEPM (2013) Schedule B(3)
Separatory Funnel Extraction of Liquids	ORG14	WATER	In house: Referenced to USEPA SW 846 - 3510B 100 mL to 1L of sample is transferred to a separatory funnel and serially extracted three times using 60mL DCM for each extract. The resultant extracts are combined, dehydrated and concentrated for analysis. This method is compliant with NEPM (2013) Schedule B(3) . ALS default excludes sediment which may be resident in the container.
Volatiles Water Preparation	ORG16-W	WATER	A 5 mL aliquot or 5 mL of a diluted sample is added to a 40 mL VOC vial for sparging.

CHAIN OF CUSTODY

ALS Laboratory: please tick →

☐ADELAIDE 21 Burma Road Pooraka [illegible]095 Ph: 08 8359 0890 E: adelaide@alsglobal.com

☐BRISBANE 32 Shand Street Stafford QLD 4053 Ph: 07 3243 7222 E: samples.brisbane@alsglobal.com

☐GLADSTONE 46 Callemondah Drive Clinton QLD 4680 Ph: 07 7471 5800 E: gladstone@alsglobal.com

☐MACKAY 78 Harbour Road Mackay QLD 4740 Ph: 07 4944 0177 E: mackay@alsglobal.com

☐MELBOURNE 2-4 Westall Road Springvale VIC 3171 Ph: 03 8549 9600 E: samples.melbourne@alsglobal.com

☐MUDGEE 27 Sydney Road Mudgee NSW 2850 Ph: 02 6372 6735 E: mudgee.mail@alsglobal.com

☐NEWCAS[illegible] 5 Rose Gum Road Warabrook NSW 2304 Ph: 02 4968 9433 E: samples.newcastle@alsglobal.com

☐NOWRA 4/13 Geary Place North Nowra NSW 2541 Ph: 024423 2063 E: nowra@alsglobal.com

☐PERTH 10 Hod Way Malaga WA 6090 Ph: 08 9209 7655 E: samples.perth@alsglobal.com

☐SYDNEY 277-289 Woodpark Road Smithfield NSW 2164 Ph: 02 8784 8555 E: samples.sydney@alsglobal.com

☐TOWNSVILLE 14-15 Desma Court Bohle QLD 4818 Ph: 07 4796 0600 E: townesville.environmental@alsglobal.com

☐WOLLONGONG 99 Kenny Street Wollongong NSW 2500 Ph: 02 4225 3125 E: portkembla@alsglobal.com

CLIENT: GHD Pty Ltd	TURNAROUND REQUIREMENT (Standard TAT may be longer for some tests e.g., Ultra Trace Organics)	☒ Standard TAT (List due date): 22.3.17	FOR LABORATORY USE ONLY (Circle)
OFFICE: Sydney		☐ Non Standard or urgent TAT (List due date):	Custody Seal Intact? Yes / No / N/A
PROJECT: 21-25583-03 Alexandria	ALS QUOTE NO.: EN/005/16	COC SEQUENCE NUMBER (Circle) COC: 1 2 3 4 5 6 7	Free Ice / frozen ice bricks present upon receipt? Yes / No / N/A
ORDER NUMBER:		OF: 1 2 3 4 5 6 7	Random Sample Temperature on Receipt: °C
PROJECT MANAGER: Ben Anderson	CONTACT PH: 02 9239 7170 / 0408 713 343		Other comments:

SAMPLER: ~~Terry Nham~~ Dylan Galt	SAMPLER MOBILE: ~~0408 254 883~~	RELINQUISHED BY: Dylan Galt ~~Terry Nham~~ (GHD)	RECEIVED BY: Frank ALS	RELINQUISHED BY: / RECEIVED BY:
COC emailed to ALS? (YES / NO)	EDD FORMAT (or default):	DATE/TIME: 15.3.17	DATE/TIME: 15-3-17 1635	DATE/TIME: / DATE/TIME:
Email Reports to: ben.anderson@ghd.com ~~tony.nham@ghd.com~~ dylan.galt@ghd.com				
Email Invoice to (will default to PM if no other addresses are listed):				

COMMENTS/SPECIAL HANDLING/STORAGE OR DISPOSAL: T3 - Test BTEX only

ALS USE	SAMPLE DETAILS MATRIX: SOLID (S) WATER (W)			CONTAINER INFORMATION		ANALYSIS REQUIRED Including SUITES (NB. Suite Codes must be listed to attract suite price) Where Metals are required, specify Total (unfiltered bottle required) or Dissolved (field filtered bottle required).											
LAB ID	SAMPLE ID	DATE / TIME	MATRIX	TYPE & PRESERVATIVE (refer to codes below)	TOTAL CONTAINERS	PFCs (Full Suite)	PFCs (Full Suite) - Leachability	TRH, BTEX, PAH, 8 Metals (Suite S-26 / W-26)	TOC	pH	CEC	TDS	Major Anions / Cations	Alkalinity			
1	SW01	15.3.17	W	P,N,AG,VS		X		X	X	X	X	X	X	X			HT
2	SW02	↓	W	↓		X		X	X	X	X	X	X	X			Environmental Division Sydney Work Order Reference ES1706190
3	SW03		W			X		X	X	X	X	X	X	X			
4	SW04		W	V		X		X	X	X	X	X	X	X			
5	Dup1		W			X		X	X	X	X	X	X	X			
6	SS01		S	P		X	X	X	X	X	X	X	X	X			
7	SS02		S	P		X	X	X	X	X	X	X	X	X			
8	SS03		S	P		X	X	X	X	X	X	X	X	X			
9	Dup1		S	P		X	X	X	X	X	X	X	X	X			
10	T3		W	—				X							→		BTEX only
11	SP_450_01	V	W	P		X			X	X	X	X	X	X			
					TOTAL												

Telephone : + 61-2-8784 8555

Water Container Codes: P = Unpreserved Plastic; N = Nitric Preserved Plastic; ORC = Nitric Preserved ORC; SH = Sodium Hydroxide/Cd Preserved; S = Sodium Hydroxide Preserved Plastic; AG = Amber Glass Unpreserved; AP - Airfreight Unpreserved Plastic
V = VOA Vial HCl Preserved; VB = VOA Vial Sodium Bisulphate Preserved; VS = VOA Vial Sulfuric Preserved; AV = Airfreight Unpreserved Vial SG = Sulfuric Preserved Amber Glass; H = HCl preserved Plastic; HS = HCl preserved Speciation bottle; SP = Sulfuric Preserved Plastic; F = Formaldehyde Preserved Glass; Z = Zinc Acetate Preserved Bottle; E = EDTA Preserved Bottles; ST = Sterile Bottle; ASS = Plastic Bag for Acid Sulphate Soils; B = Unpreserved Bag.

ES1706190

eurofins | mgt

Certificate of Analysis

GHD Pty Ltd NSW
Level 15, 133 Castlereagh Street
Sydney
NSW 2000

NATA Accredited
Accreditation Number 1261
Site Number 18217

Accredited for compliance with ISO/IEC 17025 – Testing
The results of the tests, calibrations and/or measurements included in this document are traceable to Australian/national standards.

Attention: **Ben Anderson**

Report **538199-S**
Project name ALEXANDRIA
Project ID 21-25583-03
Received Date Mar 15, 2017

Client Sample ID			**SPLIT 1**
Sample Matrix			**Soil**
Eurofins | mgt Sample No.			**S17-Ma17193**
Date Sampled			**Mar 15, 2017**
Test/Reference	LOR	Unit	
Total Recoverable Hydrocarbons - 1999 NEPM Fractions			
TRH C6-C9	20	mg/kg	< 20
TRH C10-C14	20	mg/kg	< 20
TRH C15-C28	50	mg/kg	55
TRH C29-C36	50	mg/kg	< 50
TRH C10-36 (Total)	50	mg/kg	55
BTEX			
Benzene	0.1	mg/kg	< 0.1
Toluene	0.1	mg/kg	< 0.1
Ethylbenzene	0.1	mg/kg	< 0.1
m&p-Xylenes	0.2	mg/kg	< 0.2
o-Xylene	0.1	mg/kg	< 0.1
Xylenes - Total	0.3	mg/kg	< 0.3
4-Bromofluorobenzene (surr.)	1	%	77
Total Recoverable Hydrocarbons - 2013 NEPM Fractions			
Naphthalene[N02]	0.5	mg/kg	< 0.5
TRH >C10-C16 less Naphthalene (F2)[N01]	50	mg/kg	< 50
TRH C6-C10	20	mg/kg	< 20
TRH C6-C10 less BTEX (F1)[N04]	20	mg/kg	< 20
Polycyclic Aromatic Hydrocarbons			
Benzo(a)pyrene TEQ (lower bound) *	0.5	mg/kg	< 0.5
Benzo(a)pyrene TEQ (medium bound) *	0.5	mg/kg	0.6
Benzo(a)pyrene TEQ (upper bound) *	0.5	mg/kg	1.2
Acenaphthene	0.5	mg/kg	< 0.5
Acenaphthylene	0.5	mg/kg	< 0.5
Anthracene	0.5	mg/kg	< 0.5
Benz(a)anthracene	0.5	mg/kg	0.5
Benzo(a)pyrene	0.5	mg/kg	< 0.5
Benzo(b&j)fluoranthene[N07]	0.5	mg/kg	< 0.5
Benzo(g.h.i)perylene	0.5	mg/kg	< 0.5
Benzo(k)fluoranthene	0.5	mg/kg	< 0.5
Chrysene	0.5	mg/kg	< 0.5
Dibenz(a.h)anthracene	0.5	mg/kg	< 0.5
Fluoranthene	0.5	mg/kg	< 0.5
Fluorene	0.5	mg/kg	< 0.5
Indeno(1.2.3-cd)pyrene	0.5	mg/kg	< 0.5

Client Sample ID			SPLIT 1
Sample Matrix			Soil
Eurofins | mgt Sample No.			S17-Ma17193
Date Sampled			Mar 15, 2017
Test/Reference	LOR	Unit	
Polycyclic Aromatic Hydrocarbons			
Naphthalene	0.5	mg/kg	< 0.5
Phenanthrene	0.5	mg/kg	< 0.5
Pyrene	0.5	mg/kg	< 0.5
Total PAH*	0.5	mg/kg	0.5
2-Fluorobiphenyl (surr.)	1	%	92
p-Terphenyl-d14 (surr.)	1	%	110
Total Recoverable Hydrocarbons - 2013 NEPM Fractions			
TRH >C10-C16	50	mg/kg	< 50
TRH >C16-C34	100	mg/kg	< 100
TRH >C34-C40	100	mg/kg	< 100
Perfluoroalkyl carboxylic acids (PFCAs)			
Perfluorobutanoic acid (PFBA)	5	ug/kg	< 5
13C4-PFBA (surr.)	1	%	67
Perfluoropentanoic acid (PFPeA)	5	ug/kg	< 5
13C5-PFPeA (surr.)	1	%	64
Perfluorohexanoic acid (PFHxA)	5	ug/kg	< 5
13C5-PFHxA (surr.)	1	%	73
Perfluoroheptanoic acid (PFHpA)	5	ug/kg	< 5
13C4-PFHpA (surr.)	1	%	79
Perfluorooctanoic acid (PFOA)	5	ug/kg	< 5
13C8-PFOA (surr.)	1	%	77
Perfluorononanoic acid (PFNA)	5	ug/kg	< 5
13C5-PFNA (surr.)	1	%	92
Perfluorodecanoic acid (PFDA)	5	ug/kg	< 5
13C6-PFDA (surr.)	1	%	101
Perfluoroundecanoic acid (PFUnA)	5	ug/kg	< 5
13C2-PFUnDA (surr.)	1	%	99
Perfluorododecanoic acid (PFDoA)	5	ug/kg	< 5
13C2-PFDoDA (surr.)	1	%	101
Perfluorotridecanoic acid (PFTrDA)	5	ug/kg	< 5
Perfluorotetradecanoic acid (PFTeDA)	5	ug/kg	< 5
13C2-PFTeDA (surr.)	1	%	111
Perfluoroalkane sulfonamides (PFASAs)			
Perfluorooctane sulfonamide (FOSA)	5	ug/kg	< 5
13C8-FOSA (surr.)	1	%	62
N-methylperfluoro-1-octane sulfonamide (N-MeFOSA)	5	ug/kg	< 5
D3-N-MeFOSA (surr.)	1	%	104
N-ethylperfluoro-1-octane sulfonamide (N-EtFOSA)	5	ug/kg	< 5
D5-N-EtFOSA (surr.)	1	%	99
2-(N-methylperfluoro-1-octane sulfonamido)-ethanol (N-MeFOSE)	5	ug/kg	< 5
D7-N-MeFOSE (surr.)	1	%	85
2-(N-ethylperfluoro-1-octane sulfonamido)-ethanol (N-EtFOSE)	5	ug/kg	< 5
D9-N-EtFOSE (surr.)	1	%	85
N-ethyl-perfluorooctanesulfonamidoacetic acid (N-EtFOSAA)	10	ug/kg	< 10
D5-N-EtFOSAA (surr.)	1	%	103
N-methyl-perfluorooctanesulfonamidoacetic acid (N-MeFOSAA)	10	ug/kg	< 10
D3-N-MeFOSAA (surr.)	1	%	110

Client Sample ID			SPLIT 1
Sample Matrix			Soil
Eurofins | mgt Sample No.			S17-Ma17193
Date Sampled			Mar 15, 2017
Test/Reference	LOR	Unit	
Perfluoroalkane sulfonic acids & Perfluoroalkane sulfonates (PFSAs)			
Perfluorobutanesulfonic acid (PFBS)	5	ug/kg	< 5
13C3-PFBS (surr.)	1	%	68
Perfluoropentanesulfonic acid (PFPeS)	5	ug/kg	< 5
Perfluorohexanesulfonic acid (PFHxS)	5	ug/kg	< 5
18O2-PFHxS (surr.)	1	%	69
Perfluoroheptanesulfonic acid (PFHpS)	5	ug/kg	< 5
Perfluorooctanesulfonic acid (PFOS)[N11]	5	ug/kg	< 5
13C8-PFOS (surr.)	1	%	89
Perfluorodecanesulfonic acid (PFDS)	5	ug/kg	< 5
n:2 Fluorotelomer sulfonic acids			
1H.1H.2H.2H-perfluorohexanesulfonic acid (4:2 FTS)	5	ug/kg	< 5
13C2-4:2 FTS (surr.)	1	%	43
1H.1H.2H.2H-perfluorooctanesulfonic acid (6:2 FTS)	10	ug/kg	< 10
13C2-6:2 FTS (surr.)	1	%	56
1H.1H.2H.2H-perfluorodecanesulfonic acid (8:2 FTS)	5	ug/kg	< 5
13C2-8:2 FTS (surr.)	1	%	82
1H.1H.2H.2H-perfluorododecanesulfonic acid (10:2 FTS)	5	ug/kg	< 5
pH (1:5 Aqueous extract)	0.1	pH Units	7.0
Total Organic Carbon	0.1	%	1.6
% Moisture	1	%	27
Heavy Metals			
Arsenic	2	mg/kg	2.6
Cadmium	0.4	mg/kg	< 0.4
Chromium	5	mg/kg	7.7
Copper	5	mg/kg	52
Lead	5	mg/kg	54
Mercury	0.1	mg/kg	< 0.1
Nickel	5	mg/kg	6.1
Zinc	5	mg/kg	210

Sample History

Where samples are submitted/analysed over several days, the last date of extraction and analysis is reported.
A recent review of our LIMS has resulted in the correction or clarification of some method identifications. Due to this, some of the method reference information on reports has changed. However, no substantive change has been made to our laboratory methods, and as such there is no change in the validity of current or previous results (regarding both quality and NATA accreditation).

If the date and time of sampling are not provided, the Laboratory will not be responsible for compromised results should testing be performed outside the recommended holding time.

Description	Testing Site	Extracted	Holding Time
Total Recoverable Hydrocarbons - 1999 NEPM Fractions	Sydney	Mar 20, 2017	14 Day
- Method: TRH C6-C36 - LTM-ORG-2010			
BTEX	Sydney	Mar 20, 2017	14 Day
- Method: TRH C6-C40 - LTM-ORG-2010			
Total Recoverable Hydrocarbons - 2013 NEPM Fractions	Sydney	Mar 20, 2017	14 Day
- Method: TRH C6-C40 - LTM-ORG-2010			
Polycyclic Aromatic Hydrocarbons	Sydney	Mar 20, 2017	14 Day
- Method: E007 Polyaromatic Hydrocarbons (PAH)			
Total Recoverable Hydrocarbons - 2013 NEPM Fractions	Sydney	Mar 20, 2017	14 Day
- Method: TRH C6-C40 - LTM-ORG-2010			
Metals M8	Sydney	Mar 20, 2017	28 Day
- Method: LTM-MET-3040_R0 TOTAL AND DISSOLVED METALS AND MERCURY IN WATERS BY ICP-MS			
Per- and Polyfluorinated Alkyl Substances (PFASs)			
Perfluoroalkyl carboxylic acids (PFCAs)	Brisbane	Mar 17, 2017	180 Day
- Method: LTM-ORG-2100 Per- and Polyfluorinated Alkyl Substances by LC-MS/MS			
Perfluoroalkane sulfonamides (PFASAs)	Brisbane	Mar 17, 2017	180 Day
- Method: LTM-ORG-2100 Per- and Polyfluorinated Alkyl Substances by LC-MS/MS			
Perfluoroalkane sulfonic acids & Perfluoroalkane sulfonates (PFSAs)	Brisbane	Mar 17, 2017	180 Day
- Method: LTM-ORG-2100 Per- and Polyfluorinated Alkyl Substances by LC-MS/MS			
n:2 Fluorotelomer sulfonic acids	Brisbane	Mar 17, 2017	180 Day
- Method: LTM-ORG-2100 Per- and Polyfluorinated Alkyl Substances by LC-MS/MS			
pH (1:5 Aqueous extract)	Sydney	Mar 21, 2017	7 Day
- Method: LTM-GEN-7090 pH in soil by ISE			
Total Organic Carbon	Melbourne	Mar 20, 2017	28 Day
- Method: APHA 5310B Total Organic Carbon			
% Moisture	Sydney	Mar 16, 2017	14 Day
- Method: LTM-GEN-7080 Moisture			

eurofins | mgt

ABN– 50 005 085 521
e.mail : EnviroSales@eurofins.com
web : www.eurofins.com.au

Melbourne
2-5 Kingston Town Close
Oakleigh VIC 3166
Phone : +61 3 8564 5000
NATA # 1261
Site # 1254 & 14271

Sydney
Unit F3, Building F
16 Mars Road
Lane Cove West NSW 2066
Phone : +61 2 9900 8400
NATA # 1261 Site # 18217

Brisbane
1/21 Smallwood Place
Murarrie QLD 4172
Phone : +61 7 3902 4600
NATA # 1261 Site # 20794

Perth
2/91 Leach Highway
Kewdale WA 6105
Phone : +61 8 9251 9600
NATA # 1261
Site # 18217

Company Name: GHD Pty Ltd NSW
Address: Level 15, 133 Castlereagh Street
Sydney
NSW 2000

Project Name: ALEXANDRIA
Project ID: 21-25583-03

Order No.:
Report #: 538199
Phone: 02 9239 7100
Fax: 02 9239 7199

Received: Mar 15, 2017 4:55 PM
Due: Mar 22, 2017
Priority: 5 Day
Contact Name: Ben Anderson

Eurofins | mgt Analytical Services Manager : Nibha Vaidya

Sample Detail						pH	pH (1:5 Aqueous extract)	Total Organic Carbon	Moisture Set	Eurofins | mgt Suite B7	Per- and Polyfluorinated Alkyl Substances (PFASs)
Melbourne Laboratory - NATA Site # 1254 & 14271						X		X			
Sydney Laboratory - NATA Site # 18217							X		X	X	
Brisbane Laboratory - NATA Site # 20794											X
Perth Laboratory - NATA Site # 18217											
External Laboratory											
No	**Sample ID**	**Sample Date**	**Sampling Time**	**Matrix**	**LAB ID**						
1	SPLIT 1	Mar 15, 2017		Water	S17-Ma17192	X		X		X	X
2	SPLIT 1	Mar 15, 2017		Soil	S17-Ma17193		X	X	X	X	X
Test Counts						1	1	2	1	2	2

Internal Quality Control Review and Glossary

General

1. Laboratory QC results for Method Blanks, Duplicates, Matrix Spikes, and Laboratory Control Samples are included in this QC report where applicable. Additional QC data may be available on request.
2. All soil results are reported on a dry basis, unless otherwise stated.
3. Actual LORs are matrix dependant. Quoted LORs may be raised where sample extracts are diluted due to interferences.
4. Results are uncorrected for matrix spikes or surrogate recoveries.
5. SVOC analysis on waters are performed on homogenised, unfiltered samples, unless noted otherwise.
6. Samples were analysed on an 'as received' basis. 7. This report replaces any interim results previously issued.

Holding Times

Please refer to 'Sample Preservation and Container Guide' for holding times (QS3001).

For samples received on the last day of holding time, notification of testing requirements should have been received at least 6 hours prior to sample receipt deadlines as stated on the Sample Receipt Advice.

If the Laboratory did not receive the information in the required timeframe, and regardless of any other integrity issues, suitably qualified results may still be reported.

Holding times apply from the date of sampling, therefore compliance to these may be outside the laboratory's control.

****NOTE:** pH duplicates are reported as a range NOT as RPD

Units

mg/kg: milligrams per Kilogram

ug/l: micrograms per litre

ppb: Parts per billion

org/100ml: Organisms per 100 millilitres

MPN/100mL: Most Probable Number of organisms per 100 millilitres

mg/l: milligrams per litre

ppm: Parts per million

%: Percentage

NTU: Nephelometric Turbidity Units

Terms

Dry	Where a moisture has been determined on a solid sample the result is expressed on a dry basis.
LOR	Limit of Reporting.
SPIKE	Addition of the analyte to the sample and reported as percentage recovery.
RPD	Relative Percent Difference between two Duplicate pieces of analysis.
LCS	Laboratory Control Sample - reported as percent recovery
CRM	Certified Reference Material - reported as percent recovery
Method Blank	In the case of solid samples these are performed on laboratory certified clean sands. In the case of water samples these are performed on de-ionised water.
Surr - Surrogate	The addition of a like compound to the analyte target and reported as percentage recovery.
Duplicate	A second piece of analysis from the same sample and reported in the same units as the result to show comparison.
Batch Duplicate	A second piece of analysis from a sample outside of the clients batch of samples but run within the laboratory batch of analysis.
Batch SPIKE	Spike recovery reported on a sample from outside of the clients batch of samples but run within the laboratory batch of analysis.
USEPA	United States Environmental Protection Agency
APHA	American Public Health Association
TCLP	Toxicity Characteristic Leaching Procedure
COC	Chain of Custody
SRA	Sample Receipt Advice
CP	Client Parent - QC was performed on samples pertaining to this report
NCP	Non-Client Parent - QC performed on samples not pertaining to this report, QC is representative of the sequence or batch that client samples were analysed within
TEQ	Toxic Equivalency Quotient

QC - Acceptance Criteria

RPD Duplicates: Global RPD Duplicates Acceptance Criteria is 30% however the following acceptance guidelines are equally applicable:

Results <10 times the LOR : No Limit

Results between 10-20 times the LOR : RPD must lie between 0-50%

Results >20 times the LOR : RPD must lie between 0-30%

Surrogate Recoveries: Recoveries must lie between 50-150%-Phenols & PFASs 20-130%

QC Data General Comments

1. Where a result is reported as a less than (<), higher than the nominated LOR, this is due to either matrix interference, extract dilution required due to interferences or contaminant levels within the sample, high moisture content or insufficient sample provided.
2. Duplicate data shown within this report that states the word "BATCH" is a Batch Duplicate from outside of your sample batch, but within the laboratory sample batch at a 1:10 ratio. The Parent and Duplicate data shown is not data from your samples.
3. Organochlorine Pesticide analysis - where reporting LCS data, Toxaphene & Chlordane are not added to the LCS.
4. Organochlorine Pesticide analysis - where reporting Spike data, Toxaphene is not added to the Spike.
5. Total Recoverable Hydrocarbons - where reporting Spike & LCS data, a single spike of commercial Hydrocarbon products in the range of C12-C30 is added and it's Total Recovery is reported in the C10-C14 cell of the Report.
6. pH and Free Chlorine analysed in the laboratory - Analysis on this test must begin within 30 minutes of sampling.Therefore laboratory analysis is unlikely to be completed within holding time. Analysis will begin as soon as possible after sample receipt.
7. Recovery Data (Spikes & Surrogates) - where chromatographic interference does not allow the determination of Recovery the term "INT" appears against that analyte.
8. Polychlorinated Biphenyls are spiked only using Aroclor 1260 in Matrix Spikes and LCS.
9. For Matrix Spikes and LCS results a dash " -" in the report means that the specific analyte was not added to the QC sample.
10. Duplicate RPDs are calculated from raw analytical data thus it is possible to have two sets of data.

Quality Control Results

Test	Units	Result 1			Acceptance Limits	Pass Limits	Qualifying Code
Method Blank							
Total Recoverable Hydrocarbons - 1999 NEPM Fractions							
TRH C6-C9	mg/kg	< 20			20	Pass	
TRH C10-C14	mg/kg	< 20			20	Pass	
TRH C15-C28	mg/kg	< 50			50	Pass	
TRH C29-C36	mg/kg	< 50			50	Pass	
Method Blank							
BTEX							
Benzene	mg/kg	< 0.1			0.1	Pass	
Toluene	mg/kg	< 0.1			0.1	Pass	
Ethylbenzene	mg/kg	< 0.1			0.1	Pass	
m&p-Xylenes	mg/kg	< 0.2			0.2	Pass	
o-Xylene	mg/kg	< 0.1			0.1	Pass	
Xylenes - Total	mg/kg	< 0.3			0.3	Pass	
Method Blank							
Total Recoverable Hydrocarbons - 2013 NEPM Fractions							
Naphthalene	mg/kg	< 0.5			0.5	Pass	
TRH C6-C10	mg/kg	< 20			20	Pass	
Method Blank							
Polycyclic Aromatic Hydrocarbons							
Acenaphthene	mg/kg	< 0.5			0.5	Pass	
Acenaphthylene	mg/kg	< 0.5			0.5	Pass	
Anthracene	mg/kg	< 0.5			0.5	Pass	
Benz(a)anthracene	mg/kg	< 0.5			0.5	Pass	
Benzo(a)pyrene	mg/kg	< 0.5			0.5	Pass	
Benzo(b&j)fluoranthene	mg/kg	< 0.5			0.5	Pass	
Benzo(g.h.i)perylene	mg/kg	< 0.5			0.5	Pass	
Benzo(k)fluoranthene	mg/kg	< 0.5			0.5	Pass	
Chrysene	mg/kg	< 0.5			0.5	Pass	
Dibenz(a.h)anthracene	mg/kg	< 0.5			0.5	Pass	
Fluoranthene	mg/kg	< 0.5			0.5	Pass	
Fluorene	mg/kg	< 0.5			0.5	Pass	
Indeno(1.2.3-cd)pyrene	mg/kg	< 0.5			0.5	Pass	
Naphthalene	mg/kg	< 0.5			0.5	Pass	
Phenanthrene	mg/kg	< 0.5			0.5	Pass	
Pyrene	mg/kg	< 0.5			0.5	Pass	
Method Blank							
Total Recoverable Hydrocarbons - 2013 NEPM Fractions							
TRH >C10-C16	mg/kg	< 50			50	Pass	
TRH >C16-C34	mg/kg	< 100			100	Pass	
TRH >C34-C40	mg/kg	< 100			100	Pass	
Method Blank							
Perfluoroalkyl carboxylic acids (PFCAs)							
Perfluorobutanoic acid (PFBA)	ug/kg	< 5			5	Pass	
Perfluoropentanoic acid (PFPeA)	ug/kg	< 5			5	Pass	
Perfluorohexanoic acid (PFHxA)	ug/kg	< 5			5	Pass	
Perfluoroheptanoic acid (PFHpA)	ug/kg	< 5			5	Pass	
Perfluorooctanoic acid (PFOA)	ug/kg	< 5			5	Pass	
Perfluorononanoic acid (PFNA)	ug/kg	< 5			5	Pass	
Perfluorodecanoic acid (PFDA)	ug/kg	< 5			5	Pass	
Perfluoroundecanoic acid (PFUnA)	ug/kg	< 5			5	Pass	
Perfluorododecanoic acid (PFDoA)	ug/kg	< 5			5	Pass	

Test	Units	Result 1			Acceptance Limits	Pass Limits	Qualifying Code
Perfluorotridecanoic acid (PFTrDA)	ug/kg	< 5			5	Pass	
Perfluorotetradecanoic acid (PFTeDA)	ug/kg	< 5			5	Pass	
Method Blank							
Perfluoroalkane sulfonamides (PFASAs)							
Perfluorooctane sulfonamide (FOSA)	ug/kg	< 5			5	Pass	
N-methylperfluoro-1-octane sulfonamide (N-MeFOSA)	ug/kg	< 5			5	Pass	
N-ethylperfluoro-1-octane sulfonamide (N-EtFOSA)	ug/kg	< 5			5	Pass	
2-(N-methylperfluoro-1-octane sulfonamido)-ethanol (N-MeFOSE)	ug/kg	< 5			5	Pass	
2-(N-ethylperfluoro-1-octane sulfonamido)-ethanol (N-EtFOSE)	ug/kg	< 5			5	Pass	
N-ethyl-perfluorooctanesulfonamidoacetic acid (N-EtFOSAA)	ug/kg	< 10			10	Pass	
N-methyl-perfluorooctanesulfonamidoacetic acid (N-MeFOSAA)	ug/kg	< 10			10	Pass	
Method Blank							
Perfluoroalkane sulfonic acids & Perfluoroalkane sulfonates (PFSAs)							
Perfluorobutanesulfonic acid (PFBS)	ug/kg	< 5			5	Pass	
Perfluoropentanesulfonic acid (PFPeS)	ug/kg	< 5			5	Pass	
Perfluorohexanesulfonic acid (PFHxS)	ug/kg	< 5			5	Pass	
Perfluoroheptanesulfonic acid (PFHpS)	ug/kg	< 5			5	Pass	
Perfluorooctanesulfonic acid (PFOS)	ug/kg	< 5			5	Pass	
Perfluorodecanesulfonic acid (PFDS)	ug/kg	< 5			5	Pass	
Method Blank							
n:2 Fluorotelomer sulfonic acids							
1H.1H.2H.2H-perfluorohexanesulfonic acid (4:2 FTS)	ug/kg	< 5			5	Pass	
1H.1H.2H.2H-perfluorooctanesulfonic acid (6:2 FTS)	ug/kg	< 10			10	Pass	
1H.1H.2H.2H-perfluorodecanesulfonic acid (8:2 FTS)	ug/kg	< 5			5	Pass	
1H.1H.2H.2H-perfluorododecanesulfonic acid (10:2 FTS)	ug/kg	< 5			5	Pass	
Method Blank							
Total Organic Carbon	%	< 0.1			0.1	Pass	
Method Blank							
Heavy Metals							
Arsenic	mg/kg	< 2			2	Pass	
Cadmium	mg/kg	< 0.4			0.4	Pass	
Chromium	mg/kg	< 5			5	Pass	
Copper	mg/kg	< 5			5	Pass	
Lead	mg/kg	< 5			5	Pass	
Mercury	mg/kg	< 0.1			0.1	Pass	
Nickel	mg/kg	< 5			5	Pass	
Zinc	mg/kg	< 5			5	Pass	
LCS - % Recovery							
Total Recoverable Hydrocarbons - 1999 NEPM Fractions							
TRH C6-C9	%	124			70-130	Pass	
TRH C10-C14	%	75			70-130	Pass	
LCS - % Recovery							
BTEX							
Benzene	%	122			70-130	Pass	
Toluene	%	123			70-130	Pass	
Ethylbenzene	%	129			70-130	Pass	
m&p-Xylenes	%	126			70-130	Pass	
o-Xylene	%	125			70-130	Pass	
Xylenes - Total	%	125			70-130	Pass	
LCS - % Recovery							
Total Recoverable Hydrocarbons - 2013 NEPM Fractions							
Naphthalene	%	125			70-130	Pass	
TRH C6-C10	%	124			70-130	Pass	
LCS - % Recovery							

Test	Units	Result 1			Acceptance Limits	Pass Limits	Qualifying Code
Polycyclic Aromatic Hydrocarbons							
Acenaphthene	%	103			70-130	Pass	
Acenaphthylene	%	100			70-130	Pass	
Anthracene	%	99			70-130	Pass	
Benz(a)anthracene	%	92			70-130	Pass	
Benzo(a)pyrene	%	113			70-130	Pass	
Benzo(b&j)fluoranthene	%	95			70-130	Pass	
Benzo(g.h.i)perylene	%	103			70-130	Pass	
Benzo(k)fluoranthene	%	110			70-130	Pass	
Chrysene	%	111			70-130	Pass	
Dibenz(a.h)anthracene	%	86			70-130	Pass	
Fluoranthene	%	92			70-130	Pass	
Fluorene	%	94			70-130	Pass	
Indeno(1.2.3-cd)pyrene	%	109			70-130	Pass	
Naphthalene	%	102			70-130	Pass	
Phenanthrene	%	87			70-130	Pass	
Pyrene	%	89			70-130	Pass	
LCS - % Recovery							
Total Recoverable Hydrocarbons - 2013 NEPM Fractions							
TRH >C10-C16	%	78			70-130	Pass	
LCS - % Recovery							
Perfluoroalkyl carboxylic acids (PFCAs)							
Perfluorobutanoic acid (PFBA)	%	132			50-150	Pass	
Perfluoropentanoic acid (PFPeA)	%	134			50-150	Pass	
Perfluorohexanoic acid (PFHxA)	%	133			50-150	Pass	
Perfluoroheptanoic acid (PFHpA)	%	127			50-150	Pass	
Perfluorooctanoic acid (PFOA)	%	120			50-150	Pass	
Perfluorononanoic acid (PFNA)	%	107			50-150	Pass	
Perfluorodecanoic acid (PFDA)	%	99			50-150	Pass	
Perfluoroundecanoic acid (PFUnA)	%	97			50-150	Pass	
Perfluorododecanoic acid (PFDoA)	%	95			50-150	Pass	
Perfluorotridecanoic acid (PFTrDA)	%	99			50-150	Pass	
Perfluorotetradecanoic acid (PFTeDA)	%	89			50-150	Pass	
LCS - % Recovery							
Perfluoroalkane sulfonamides (PFASAs)							
Perfluorooctane sulfonamide (FOSA)	%	95			50-150	Pass	
N-methylperfluoro-1-octane sulfonamide (N-MeFOSA)	%	102			50-150	Pass	
N-ethylperfluoro-1-octane sulfonamide (N-EtFOSA)	%	86			50-150	Pass	
2-(N-methylperfluoro-1-octane sulfonamido)-ethanol (N-MeFOSE)	%	86			50-150	Pass	
2-(N-ethylperfluoro-1-octane sulfonamido)-ethanol (N-EtFOSE)	%	84			50-150	Pass	
N-ethyl-perfluorooctanesulfonamidoacetic acid (N-EtFOSAA)	%	91			50-150	Pass	
N-methyl-perfluorooctanesulfonamidoacetic acid (N-MeFOSAA)	%	94			50-150	Pass	
LCS - % Recovery							
Perfluoroalkane sulfonic acids & Perfluoroalkane sulfonates (PFSAs)							
Perfluorobutanesulfonic acid (PFBS)	%	137			50-150	Pass	
Perfluoropentanesulfonic acid (PFPeS)	%	118			50-150	Pass	
Perfluorohexanesulfonic acid (PFHxS)	%	129			50-150	Pass	
Perfluoroheptanesulfonic acid (PFHpS)	%	98			50-150	Pass	
Perfluorooctanesulfonic acid (PFOS)	%	101			50-150	Pass	
Perfluorodecanesulfonic acid (PFDS)	%	94			50-150	Pass	
LCS - % Recovery							
n:2 Fluorotelomer sulfonic acids							
1H.1H.2H.2H-perfluorohexanesulfonic acid (4:2 FTS)	%	132			50-150	Pass	
1H.1H.2H.2H-perfluorooctanesulfonic acid (6:2 FTS)	%	130			50-150	Pass	

Test			Units	Result 1			Acceptance Limits	Pass Limits	Qualifying Code
1H.1H.2H.2H-perfluorodecanesulfonic acid (8:2 FTS)			%	119			50-150	Pass	
1H.1H.2H.2H-perfluorododecanesulfonic acid (10:2 FTS)			%	120			50-150	Pass	
LCS - % Recovery									
Total Organic Carbon			%	96			70-130	Pass	
LCS - % Recovery									
Heavy Metals									
Arsenic			%	105			70-130	Pass	
Cadmium			%	78			70-130	Pass	
Chromium			%	82			70-130	Pass	
Copper			%	85			70-130	Pass	
Lead			%	105			70-130	Pass	
Mercury			%	94			70-130	Pass	
Nickel			%	83			70-130	Pass	
Zinc			%	81			70-130	Pass	
Test	**Lab Sample ID**	**QA Source**	**Units**	**Result 1**			**Acceptance Limits**	**Pass Limits**	**Qualifying Code**
Spike - % Recovery									
Total Recoverable Hydrocarbons - 1999 NEPM Fractions				Result 1					
TRH C6-C9	S17-Ma17560	NCP	%	75			70-130	Pass	
TRH C10-C14	S17-Ma15316	NCP	%	79			70-130	Pass	
Spike - % Recovery									
BTEX				Result 1					
Benzene	S17-Ma17560	NCP	%	104			70-130	Pass	
Toluene	S17-Ma17560	NCP	%	103			70-130	Pass	
Ethylbenzene	S17-Ma17560	NCP	%	107			70-130	Pass	
m&p-Xylenes	S17-Ma17560	NCP	%	106			70-130	Pass	
o-Xylene	S17-Ma17560	NCP	%	105			70-130	Pass	
Xylenes - Total	S17-Ma17560	NCP	%	106			70-130	Pass	
Spike - % Recovery									
Total Recoverable Hydrocarbons - 2013 NEPM Fractions				Result 1					
Naphthalene	S17-Ma17560	NCP	%	104			70-130	Pass	
TRH C6-C10	S17-Ma17560	NCP	%	81			70-130	Pass	
Spike - % Recovery									
Polycyclic Aromatic Hydrocarbons				Result 1					
Acenaphthene	S17-Ma17823	NCP	%	96			70-130	Pass	
Acenaphthylene	S17-Ma17823	NCP	%	91			70-130	Pass	
Anthracene	S17-Ma17823	NCP	%	92			70-130	Pass	
Benz(a)anthracene	S17-Ma17823	NCP	%	77			70-130	Pass	
Benzo(a)pyrene	S17-Ma17823	NCP	%	108			70-130	Pass	
Benzo(b&j)fluoranthene	S17-Ma17823	NCP	%	89			70-130	Pass	
Benzo(g.h.i)perylene	S17-Ma17823	NCP	%	115			70-130	Pass	
Benzo(k)fluoranthene	S17-Ma17823	NCP	%	100			70-130	Pass	
Chrysene	S17-Ma17823	NCP	%	105			70-130	Pass	
Dibenz(a.h)anthracene	S17-Ma17823	NCP	%	98			70-130	Pass	
Fluoranthene	S17-Ma17823	NCP	%	99			70-130	Pass	
Fluorene	S17-Ma17823	NCP	%	91			70-130	Pass	
Indeno(1.2.3-cd)pyrene	S17-Ma17823	NCP	%	114			70-130	Pass	
Naphthalene	S17-Ma17823	NCP	%	101			70-130	Pass	
Phenanthrene	S17-Ma17823	NCP	%	94			70-130	Pass	
Pyrene	S17-Ma17823	NCP	%	97			70-130	Pass	
Spike - % Recovery									
Total Recoverable Hydrocarbons - 2013 NEPM Fractions				Result 1					
TRH >C10-C16	S17-Ma15316	NCP	%	82			70-130	Pass	
Spike - % Recovery									
Perfluoroalkyl carboxylic acids (PFCAs)				Result 1					

Test	Lab Sample ID	QA Source	Units	Result 1			Acceptance Limits	Pass Limits	Qualifying Code
Perfluorobutanoic acid (PFBA)	B17-Ma18673	NCP	%	129			50-150	Pass	
Perfluoropentanoic acid (PFPeA)	B17-Ma18673	NCP	%	129			50-150	Pass	
Perfluorohexanoic acid (PFHxA)	B17-Ma18673	NCP	%	139			50-150	Pass	
Perfluoroheptanoic acid (PFHpA)	B17-Ma18673	NCP	%	124			50-150	Pass	
Perfluorooctanoic acid (PFOA)	B17-Ma18673	NCP	%	119			50-150	Pass	
Perfluorononanoic acid (PFNA)	B17-Ma18673	NCP	%	105			50-150	Pass	
Perfluorodecanoic acid (PFDA)	B17-Ma18673	NCP	%	99			50-150	Pass	
Perfluoroundecanoic acid (PFUnA)	B17-Ma18673	NCP	%	96			50-150	Pass	
Perfluorododecanoic acid (PFDoA)	B17-Ma18673	NCP	%	96			50-150	Pass	
Perfluorotridecanoic acid (PFTrDA)	B17-Ma18673	NCP	%	80			50-150	Pass	
Perfluorotetradecanoic acid (PFTeDA)	B17-Ma18673	NCP	%	88			50-150	Pass	
Spike - % Recovery									
Perfluoroalkane sulfonamides (PFASAs)				Result 1					
Perfluorooctane sulfonamide (FOSA)	B17-Ma18673	NCP	%	98			50-150	Pass	
N-methylperfluoro-1-octane sulfonamide (N-MeFOSA)	B17-Ma18673	NCP	%	91			50-150	Pass	
N-ethylperfluoro-1-octane sulfonamide (N-EtFOSA)	B17-Ma18673	NCP	%	90			50-150	Pass	
2-(N-methylperfluoro-1-octane sulfonamido)-ethanol (N-MeFOSE)	B17-Ma18673	NCP	%	84			50-150	Pass	
2-(N-ethylperfluoro-1-octane sulfonamido)-ethanol (N-EtFOSE)	B17-Ma18673	NCP	%	78			50-150	Pass	
N-ethyl-perfluorooctanesulfonamidoacetic acid (N-EtFOSAA)	B17-Ma18673	NCP	%	100			50-150	Pass	
N-methyl-perfluorooctanesulfonamidoacetic acid (N-MeFOSAA)	B17-Ma18673	NCP	%	116			50-150	Pass	
Spike - % Recovery									
Perfluoroalkane sulfonic acids & Perfluoroalkane sulfonates (PFSAs)				Result 1					
Perfluorobutanesulfonic acid (PFBS)	B17-Ma18673	NCP	%	139			50-150	Pass	
Perfluoropentanesulfonic acid (PFPeS)	B17-Ma18673	NCP	%	116			50-150	Pass	
Perfluorohexanesulfonic acid (PFHxS)	B17-Ma18673	NCP	%	126			50-150	Pass	
Perfluoroheptanesulfonic acid (PFHpS)	B17-Ma18673	NCP	%	97			50-150	Pass	
Perfluorooctanesulfonic acid (PFOS)	B17-Ma18673	NCP	%	99			50-150	Pass	
Perfluorodecanesulfonic acid (PFDS)	B17-Ma18673	NCP	%	88			50-150	Pass	
Spike - % Recovery									
n:2 Fluorotelomer sulfonic acids				Result 1					
1H.1H.2H.2H-perfluorohexanesulfonic acid (4:2 FTS)	B17-Ma18673	NCP	%	132			50-150	Pass	
1H.1H.2H.2H-perfluorooctanesulfonic acid (6:2 FTS)	B17-Ma18673	NCP	%	126			50-150	Pass	
1H.1H.2H.2H-perfluorodecanesulfonic acid (8:2 FTS)	B17-Ma18673	NCP	%	114			50-150	Pass	
1H.1H.2H.2H-perfluorododecanesulfonic acid (10:2 FTS)	B17-Ma18673	NCP	%	124			50-150	Pass	
Spike - % Recovery									
Heavy Metals				Result 1					
Arsenic	S17-Ma16448	NCP	%	104			70-130	Pass	
Cadmium	S17-Ma17791	NCP	%	80			70-130	Pass	

Test	Lab Sample ID	QA Source	Units	Result 1			Acceptance Limits	Pass Limits	Qualifying Code
Chromium	S17-Ma16448	NCP	%	70			70-130	Pass	
Copper	S17-Ma17791	NCP	%	77			70-130	Pass	
Lead	S17-Ma16448	NCP	%	83			70-130	Pass	
Mercury	S17-Ma17791	NCP	%	91			70-130	Pass	
Nickel	S17-Ma17791	NCP	%	94			70-130	Pass	
Zinc	S17-Ma16448	NCP	%	87			70-130	Pass	
Test	**Lab Sample ID**	**QA Source**	**Units**	**Result 1**			**Acceptance Limits**	**Pass Limits**	**Qualifying Code**
Duplicate									
Total Recoverable Hydrocarbons - 1999 NEPM Fractions				Result 1	Result 2	RPD			
TRH C6-C9	S17-Ma18897	NCP	mg/kg	< 20	< 20	<1	30%	Pass	
TRH C10-C14	S17-Ma14480	NCP	mg/kg	260	210	20	30%	Pass	
TRH C15-C28	S17-Ma14480	NCP	mg/kg	400	360	10	30%	Pass	
TRH C29-C36	S17-Ma14480	NCP	mg/kg	250	230	10	30%	Pass	
Duplicate									
BTEX				Result 1	Result 2	RPD			
Benzene	S17-Ma18897	NCP	mg/kg	< 0.1	< 0.1	<1	30%	Pass	
Toluene	S17-Ma18897	NCP	mg/kg	< 0.1	< 0.1	<1	30%	Pass	
Ethylbenzene	S17-Ma18897	NCP	mg/kg	< 0.1	< 0.1	<1	30%	Pass	
m&p-Xylenes	S17-Ma18897	NCP	mg/kg	< 0.2	< 0.2	<1	30%	Pass	
o-Xylene	S17-Ma18897	NCP	mg/kg	< 0.1	< 0.1	<1	30%	Pass	
Xylenes - Total	S17-Ma18897	NCP	mg/kg	< 0.3	< 0.3	<1	30%	Pass	
Duplicate									
Total Recoverable Hydrocarbons - 2013 NEPM Fractions				Result 1	Result 2	RPD			
Naphthalene	S17-Ma18897	NCP	mg/kg	< 0.5	< 0.5	<1	30%	Pass	
TRH C6-C10	S17-Ma18897	NCP	mg/kg	< 20	< 20	<1	30%	Pass	
Duplicate									
Polycyclic Aromatic Hydrocarbons				Result 1	Result 2	RPD			
Acenaphthene	S17-Ma17820	NCP	mg/kg	< 0.5	< 0.5	<1	30%	Pass	
Acenaphthylene	S17-Ma17820	NCP	mg/kg	< 0.5	< 0.5	<1	30%	Pass	
Anthracene	S17-Ma17820	NCP	mg/kg	< 0.5	< 0.5	<1	30%	Pass	
Benz(a)anthracene	S17-Ma17820	NCP	mg/kg	< 0.5	0.5	3.0	30%	Pass	
Benzo(a)pyrene	S17-Ma17820	NCP	mg/kg	< 0.5	< 0.5	<1	30%	Pass	
Benzo(b&j)fluoranthene	S17-Ma17820	NCP	mg/kg	< 0.5	< 0.5	<1	30%	Pass	
Benzo(g.h.i)perylene	S17-Ma17820	NCP	mg/kg	< 0.5	< 0.5	<1	30%	Pass	
Benzo(k)fluoranthene	S17-Ma17820	NCP	mg/kg	< 0.5	< 0.5	<1	30%	Pass	
Chrysene	S17-Ma17820	NCP	mg/kg	< 0.5	< 0.5	<1	30%	Pass	
Dibenz(a.h)anthracene	S17-Ma17820	NCP	mg/kg	< 0.5	< 0.5	<1	30%	Pass	
Fluoranthene	S17-Ma17820	NCP	mg/kg	< 0.5	< 0.5	<1	30%	Pass	
Fluorene	S17-Ma17820	NCP	mg/kg	< 0.5	< 0.5	<1	30%	Pass	
Indeno(1.2.3-cd)pyrene	S17-Ma17820	NCP	mg/kg	< 0.5	< 0.5	<1	30%	Pass	
Naphthalene	S17-Ma17820	NCP	mg/kg	< 0.5	< 0.5	<1	30%	Pass	
Phenanthrene	S17-Ma17820	NCP	mg/kg	< 0.5	< 0.5	<1	30%	Pass	
Pyrene	S17-Ma17820	NCP	mg/kg	< 0.5	< 0.5	<1	30%	Pass	
Duplicate									
Total Recoverable Hydrocarbons - 2013 NEPM Fractions				Result 1	Result 2	RPD			
TRH >C10-C16	S17-Ma14480	NCP	mg/kg	250	220	17	30%	Pass	
TRH >C16-C34	S17-Ma14480	NCP	mg/kg	500	450	10	30%	Pass	
TRH >C34-C40	S17-Ma14480	NCP	mg/kg	130	120	8.0	30%	Pass	
Duplicate									
Perfluoroalkyl carboxylic acids (PFCAs)				Result 1	Result 2	RPD			
Perfluorobutanoic acid (PFBA)	S17-Ma17193	CP	ug/kg	< 5	< 5	<1	30%	Pass	
Perfluoropentanoic acid (PFPeA)	S17-Ma17193	CP	ug/kg	< 5	< 5	<1	30%	Pass	
Perfluorohexanoic acid (PFHxA)	S17-Ma17193	CP	ug/kg	< 5	< 5	<1	30%	Pass	
Perfluoroheptanoic acid (PFHpA)	S17-Ma17193	CP	ug/kg	< 5	< 5	<1	30%	Pass	

Duplicate									
Perfluoroalkyl carboxylic acids (PFCAs)				Result 1	Result 2	RPD			
Perfluorooctanoic acid (PFOA)	S17-Ma17193	CP	ug/kg	< 5	< 5	<1	30%	Pass	
Perfluorononanoic acid (PFNA)	S17-Ma17193	CP	ug/kg	< 5	< 5	<1	30%	Pass	
Perfluorodecanoic acid (PFDA)	S17-Ma17193	CP	ug/kg	< 5	< 5	<1	30%	Pass	
Perfluoroundecanoic acid (PFUnA)	S17-Ma17193	CP	ug/kg	< 5	< 5	<1	30%	Pass	
Perfluorododecanoic acid (PFDoA)	S17-Ma17193	CP	ug/kg	< 5	< 5	<1	30%	Pass	
Perfluorotridecanoic acid (PFTrDA)	S17-Ma17193	CP	ug/kg	< 5	< 5	<1	30%	Pass	
Perfluorotetradecanoic acid (PFTeDA)	S17-Ma17193	CP	ug/kg	< 5	< 5	<1	30%	Pass	
Duplicate									
Perfluoroalkane sulfonamides (PFASAs)				Result 1	Result 2	RPD			
Perfluorooctane sulfonamide (FOSA)	S17-Ma17193	CP	ug/kg	< 5	< 5	<1	30%	Pass	
N-methylperfluoro-1-octane sulfonamide (N-MeFOSA)	S17-Ma17193	CP	ug/kg	< 5	< 5	<1	30%	Pass	
N-ethylperfluoro-1-octane sulfonamide (N-EtFOSA)	S17-Ma17193	CP	ug/kg	< 5	< 5	<1	30%	Pass	
2-(N-methylperfluoro-1-octane sulfonamido)-ethanol (N-MeFOSE)	S17-Ma17193	CP	ug/kg	< 5	< 5	<1	30%	Pass	
2-(N-ethylperfluoro-1-octane sulfonamido)-ethanol (N-EtFOSE)	S17-Ma17193	CP	ug/kg	< 5	< 5	<1	30%	Pass	
N-ethyl-perfluorooctanesulfonamidoacetic acid (N-EtFOSAA)	S17-Ma17193	CP	ug/kg	< 10	< 10	<1	30%	Pass	
N-methyl-perfluorooctanesulfonamidoacetic acid (N-MeFOSAA)	S17-Ma17193	CP	ug/kg	< 10	< 10	<1	30%	Pass	
Duplicate									
Perfluoroalkane sulfonic acids & Perfluoroalkane sulfonates (PFSAs)				Result 1	Result 2	RPD			
Perfluorobutanesulfonic acid (PFBS)	S17-Ma17193	CP	ug/kg	< 5	< 5	<1	30%	Pass	
Perfluoropentanesulfonic acid (PFPeS)	S17-Ma17193	CP	ug/kg	< 5	< 5	<1	30%	Pass	
Perfluorohexanesulfonic acid (PFHxS)	S17-Ma17193	CP	ug/kg	< 5	< 5	<1	30%	Pass	
Perfluoroheptanesulfonic acid (PFHpS)	S17-Ma17193	CP	ug/kg	< 5	< 5	<1	30%	Pass	
Perfluorooctanesulfonic acid (PFOS)	S17-Ma17193	CP	ug/kg	< 5	< 5	<1	30%	Pass	
Perfluorodecanesulfonic acid (PFDS)	S17-Ma17193	CP	ug/kg	< 5	< 5	<1	30%	Pass	
Duplicate									
n:2 Fluorotelomer sulfonic acids				Result 1	Result 2	RPD			
1H.1H.2H.2H-perfluorohexanesulfonic acid (4:2 FTS)	S17-Ma17193	CP	ug/kg	< 5	< 5	<1	30%	Pass	
1H.1H.2H.2H-perfluorooctanesulfonic acid (6:2 FTS)	S17-Ma17193	CP	ug/kg	< 10	< 10	<1	30%	Pass	
1H.1H.2H.2H-perfluorodecanesulfonic acid (8:2 FTS)	S17-Ma17193	CP	ug/kg	< 5	< 5	<1	30%	Pass	
1H.1H.2H.2H-perfluorododecanesulfonic acid (10:2 FTS)	S17-Ma17193	CP	ug/kg	< 5	< 5	<1	30%	Pass	
Duplicate									
				Result 1	Result 2	RPD			
pH (1:5 Aqueous extract)	S17-Ma21916	NCP	pH Units	6.2	6.6	pass	30%	Pass	
Total Organic Carbon	S17-Ma16452	NCP	%	0.8	0.8	6.0	30%	Pass	
% Moisture	S17-Ma10261	NCP	%	9.7	11	10	30%	Pass	

Duplicate									
Heavy Metals				Result 1	Result 2	RPD			
Arsenic	S17-Ma17665	NCP	mg/kg	3.6	4.2	16	30%	Pass	
Cadmium	S17-Ma17665	NCP	mg/kg	1.6	1.9	20	30%	Pass	
Chromium	S17-Ma17665	NCP	mg/kg	700	810	14	30%	Pass	
Copper	S17-Ma17665	NCP	mg/kg	78	91	15	30%	Pass	
Lead	S17-Ma17665	NCP	mg/kg	31	31	1.0	30%	Pass	
Mercury	S17-Ma17665	NCP	mg/kg	< 0.1	< 0.1	<1	30%	Pass	
Nickel	S17-Ma17665	NCP	mg/kg	19	21	13	30%	Pass	
Zinc	S17-Ma17665	NCP	mg/kg	2200	2000	7.0	30%	Pass	

Comments

Sample Integrity

Custody Seals Intact (if used)	N/A
Attempt to Chill was evident	Yes
Sample correctly preserved	Yes
Appropriate sample containers have been used	Yes
Sample containers for volatile analysis received with minimal headspace	Yes
Samples received within HoldingTime	Yes
Some samples have been subcontracted	No

Qualifier Codes/Comments

Code	Description
N01	F2 is determined by arithmetically subtracting the "naphthalene" value from the ">C10-C16" value. The naphthalene value used in this calculation is obtained from volatiles (Purge & Trap analysis).
N02	Where we have reported both volatile (P&T GCMS) and semivolatile (GCMS) naphthalene data, results may not be identical. Provided correct sample handling protocols have been followed, any observed differences in results are likely to be due to procedural differences within each methodology. Results determined by both techniques have passed all QAQC acceptance criteria, and are entirely technically valid.
N04	F1 is determined by arithmetically subtracting the "Total BTEX" value from the "C6-C10" value. The "Total BTEX" value is obtained by summing the concentrations of BTEX analytes. The "C6-C10" value is obtained by quantitating against a standard of mixed aromatic/aliphatic analytes.
N07	Please note:- These two PAH isomers closely co-elute using the most contemporary analytical methods and both the reported concentration (and the TEQ) apply specifically to the total of the two co-eluting PAHs
N11	Isotope dilution is used for calibration of each native compound for which an exact labelled analogue is available (Isotope Dilution Quantitation). The isotopically labelled analogues allow identification and recovery correction of the concentration of the associated native PFAS compounds. Where the native PFAS compound does not have labelled analogue then the quantification is made using the Extracted Internal Standard Analyte with the closest retention time to the analyte and no recovery correction has been made (Internal Standard Quantitation).

Authorised By

Nibha Vaidya	Analytical Services Manager
Huong Le	Senior Analyst-Inorganic (VIC)
Jonathon Angell	Senior Analyst-Organic (QLD)
Ryan Hamilton	Senior Analyst-Inorganic (NSW)
Ryan Hamilton	Senior Analyst-Metal (NSW)
Ryan Hamilton	Senior Analyst-Organic (NSW)
Ryan Hamilton	Senior Analyst-Volatile (NSW)

Glenn Jackson

National Operations Manager

Final report - this Report replaces any previously issued Report

- Indicates Not Requested

* Indicates NATA accreditation does not cover the performance of this service

Measurement uncertainty of test data is available on request or please click here.

eurofins | mgt

Certificate of Analysis

GHD Pty Ltd NSW
Level 15, 133 Castlereagh Street
Sydney
NSW 2000

NATA Accredited
Accreditation Number 1261
Site Number 18217

Accredited for compliance with ISO/IEC 17025 – Testing
The results of the tests, calibrations and/or measurements included in this document are traceable to Australian/national standards.

Attention: **Ben Anderson**

Report **538199-W**
Project name ALEXANDRIA
Project ID 21-25583-03
Received Date Mar 15, 2017

Client Sample ID			**SPLIT 1**
Sample Matrix			**Water**
Eurofins | mgt Sample No.			**S17-Ma17192**
Date Sampled			**Mar 15, 2017**
Test/Reference	LOR	Unit	
Total Recoverable Hydrocarbons - 1999 NEPM Fractions			
TRH C6-C9	0.02	mg/L	< 0.02
TRH C10-C14	0.05	mg/L	< 0.05
TRH C15-C28	0.1	mg/L	< 0.1
TRH C29-C36	0.1	mg/L	< 0.1
TRH C10-36 (Total)	0.1	mg/L	< 0.1
BTEX			
Benzene	0.001	mg/L	< 0.001
Toluene	0.001	mg/L	< 0.001
Ethylbenzene	0.001	mg/L	< 0.001
m&p-Xylenes	0.002	mg/L	< 0.002
o-Xylene	0.001	mg/L	< 0.001
Xylenes - Total	0.003	mg/L	< 0.003
4-Bromofluorobenzene (surr.)	1	%	83
Total Recoverable Hydrocarbons - 2013 NEPM Fractions			
Naphthalene[N02]	0.01	mg/L	< 0.01
TRH >C10-C16 less Naphthalene (F2)[N01]	0.05	mg/L	< 0.05
TRH C6-C10	0.02	mg/L	< 0.02
TRH C6-C10 less BTEX (F1)[N04]	0.02	mg/L	< 0.02
Polycyclic Aromatic Hydrocarbons			
Acenaphthene	0.001	mg/L	< 0.001
Acenaphthylene	0.001	mg/L	< 0.001
Anthracene	0.001	mg/L	< 0.001
Benz(a)anthracene	0.001	mg/L	< 0.001
Benzo(a)pyrene	0.001	mg/L	< 0.001
Benzo(b&j)fluoranthene[N07]	0.001	mg/L	< 0.001
Benzo(g.h.i)perylene	0.001	mg/L	< 0.001
Benzo(k)fluoranthene	0.001	mg/L	< 0.001
Chrysene	0.001	mg/L	< 0.001
Dibenz(a.h)anthracene	0.001	mg/L	< 0.001
Fluoranthene	0.001	mg/L	< 0.001
Fluorene	0.001	mg/L	< 0.001
Indeno(1.2.3-cd)pyrene	0.001	mg/L	< 0.001
Naphthalene	0.001	mg/L	< 0.001
Phenanthrene	0.001	mg/L	< 0.001
Pyrene	0.001	mg/L	< 0.001

Client Sample ID			SPLIT 1
Sample Matrix			Water
Eurofins | mgt Sample No.			S17-Ma17192
Date Sampled			Mar 15, 2017
Test/Reference	LOR	Unit	
Polycyclic Aromatic Hydrocarbons			
Total PAH*	0.001	mg/L	< 0.001
2-Fluorobiphenyl (surr.)	1	%	63
p-Terphenyl-d14 (surr.)	1	%	87
Total Recoverable Hydrocarbons - 2013 NEPM Fractions			
TRH >C10-C16	0.05	mg/L	< 0.05
TRH >C16-C34	0.1	mg/L	< 0.1
TRH >C34-C40	0.1	mg/L	< 0.1
Perfluoroalkyl carboxylic acids (PFCAs)			
Perfluorobutanoic acid (PFBA)	0.05	ug/L	< 0.05
13C4-PFBA (surr.)	1	%	98
Perfluoropentanoic acid (PFPeA)	0.01	ug/L	0.02
13C5-PFPeA (surr.)	1	%	94
Perfluorohexanoic acid (PFHxA)	0.01	ug/L	0.02
13C5-PFHxA (surr.)	1	%	95
Perfluoroheptanoic acid (PFHpA)	0.01	ug/L	0.01
13C4-PFHpA (surr.)	1	%	106
Perfluorooctanoic acid (PFOA)	0.01	ug/L	[N09]0.04
13C8-PFOA (surr.)	1	%	101
Perfluorononanoic acid (PFNA)	0.01	ug/L	< 0.01
13C5-PFNA (surr.)	1	%	97
Perfluorodecanoic acid (PFDA)	0.01	ug/L	0.02
13C6-PFDA (surr.)	1	%	79
Perfluoroundecanoic acid (PFUnA)	0.01	ug/L	< 0.01
13C2-PFUnDA (surr.)	1	%	64
Perfluorododecanoic acid (PFDoA)	0.01	ug/L	< 0.01
13C2-PFDoDA (surr.)	1	%	51
Perfluorotridecanoic acid (PFTrDA)	0.01	ug/L	< 0.01
Perfluorotetradecanoic acid (PFTeDA)	0.01	ug/L	< 0.01
13C2-PFTeDA (surr.)	1	%	45
Perfluoroalkane sulfonamides (PFASAs)			
Perfluorooctane sulfonamide (FOSA)	0.05	ug/L	< 0.05
13C8-FOSA (surr.)	1	%	62
N-methylperfluoro-1-octane sulfonamide (N-MeFOSA)	0.05	ug/L	< 0.05
D3-N-MeFOSA (surr.)	1	%	35
N-ethylperfluoro-1-octane sulfonamide (N-EtFOSA)	0.05	ug/L	< 0.05
D5-N-EtFOSA (surr.)	1	%	29
2-(N-methylperfluoro-1-octane sulfonamido)-ethanol (N-MeFOSE)	0.05	ug/L	< 0.05
2-(N-ethylperfluoro-1-octane sulfonamido)-ethanol (N-EtFOSE)	0.05	ug/L	< 0.05
D9-N-EtFOSE (surr.)	1	%	32
N-ethyl-perfluorooctanesulfonamidoacetic acid (N-EtFOSAA)	0.05	ug/L	< 0.05
D5-N-EtFOSAA (surr.)	1	%	51
N-methyl-perfluorooctanesulfonamidoacetic acid (N-MeFOSAA)	0.05	ug/L	< 0.05
D3-N-MeFOSAA (surr.)	1	%	55

Client Sample ID			SPLIT 1
Sample Matrix			**Water**
Eurofins | mgt Sample No.			**S17-Ma17192**
Date Sampled			**Mar 15, 2017**
Test/Reference	LOR	Unit	
Perfluoroalkane sulfonic acids & Perfluoroalkane sulfonates (PFSAs)			
Perfluorobutanesulfonic acid (PFBS)	0.01	ug/L	< 0.01
13C3-PFBS (surr.)	1	%	104
Perfluoropentanesulfonic acid (PFPeS)	0.01	ug/L	< 0.01
Perfluorohexanesulfonic acid (PFHxS)	0.01	ug/L	[N09]0.02
18O2-PFHxS (surr.)	1	%	102
Perfluoroheptanesulfonic acid (PFHpS)	0.01	ug/L	< 0.01
Perfluorooctanesulfonic acid (PFOS)[N11]	0.01	ug/L	[N09]0.03
13C8-PFOS (surr.)	1	%	87
Perfluorodecanesulfonic acid (PFDS)	0.01	ug/L	< 0.01
n:2 Fluorotelomer sulfonic acids			
1H.1H.2H.2H-perfluorohexanesulfonic acid (4:2 FTS)	0.01	ug/L	< 0.01
13C2-4:2 FTS (surr.)	1	%	110
1H.1H.2H.2H-perfluorooctanesulfonic acid (6:2 FTS)	0.05	ug/L	< 0.05
13C2-6:2 FTS (surr.)	1	%	143
1H.1H.2H.2H-perfluorodecanesulfonic acid (8:2 FTS)	0.01	ug/L	0.01
13C2-8:2 FTS (surr.)	1	%	89
1H.1H.2H.2H-perfluorododecanesulfonic acid (10:2 FTS)	0.01	ug/L	0.02
pH	0.1	pH Units	7.3
Total Organic Carbon	5	mg/L	7.5
Heavy Metals			
Arsenic	0.001	mg/L	0.003
Cadmium	0.0002	mg/L	< 0.0002
Chromium	0.001	mg/L	0.004
Copper	0.001	mg/L	0.027
Lead	0.001	mg/L	0.023
Mercury	0.0001	mg/L	< 0.0001
Nickel	0.001	mg/L	0.002
Zinc	0.005	mg/L	0.10

Sample History

Where samples are submitted/analysed over several days, the last date of extraction and analysis is reported.
A recent review of our LIMS has resulted in the correction or clarification of some method identifications. Due to this, some of the method reference information on reports has changed. However, no substantive change has been made to our laboratory methods, and as such there is no change in the validity of current or previous results (regarding both quality and NATA accreditation).

If the date and time of sampling are not provided, the Laboratory will not be responsible for compromised results should testing be performed outside the recommended holding time.

Description	Testing Site	Extracted	Holding Time
Total Recoverable Hydrocarbons - 1999 NEPM Fractions	Sydney	Mar 20, 2017	7 Day
- Method: TRH C6-C36 - LTM-ORG-2010			
BTEX	Sydney	Mar 16, 2017	14 Day
- Method: TRH C6-C40 - LTM-ORG-2010			
Total Recoverable Hydrocarbons - 2013 NEPM Fractions	Sydney	Mar 16, 2017	7 Day
- Method: TRH C6-C40 - LTM-ORG-2010			
Polycyclic Aromatic Hydrocarbons	Sydney	Mar 20, 2017	7 Day
- Method: E007 Polyaromatic Hydrocarbons (PAH)			
Total Recoverable Hydrocarbons - 2013 NEPM Fractions	Sydney	Mar 20, 2017	7 Day
- Method: TRH C6-C40 - LTM-ORG-2010			
Metals M8	Sydney	Mar 21, 2017	28 Day
- Method: LTM-MET-3040 Metals in Waters by ICP-MS			
Per- and Polyfluorinated Alkyl Substances (PFASs)			
Perfluoroalkyl carboxylic acids (PFCAs)	Brisbane	Mar 17, 2017	14 Day
- Method: LTM-ORG-2100 Per- and Polyfluorinated Alkyl Substances by LC-MS/MS			
Perfluoroalkane sulfonamides (PFASAs)	Brisbane	Mar 17, 2017	14 Day
- Method: LTM-ORG-2100 Per- and Polyfluorinated Alkyl Substances by LC-MS/MS			
Perfluoroalkane sulfonic acids & Perfluoroalkane sulfonates (PFSAs)	Brisbane	Mar 17, 2017	14 Day
- Method: LTM-ORG-2100 Per- and Polyfluorinated Alkyl Substances by LC-MS/MS			
n:2 Fluorotelomer sulfonic acids	Brisbane	Mar 17, 2017	14 Day
- Method: LTM-ORG-2100 Per- and Polyfluorinated Alkyl Substances by LC-MS/MS			
pH	Melbourne	Mar 17, 2017	0 Hours
- Method: LTM-GEN-7090 pH in water by ISE			
Total Organic Carbon	Melbourne	Mar 17, 2017	28 Day
- Method: APHA 5310B Total Organic Carbon			

eurofins | mgt

ABN– 50 005 085 521
e.mail : EnviroSales@eurofins.com
web : www.eurofins.com.au

Melbourne
2-5 Kingston Town Close
Oakleigh VIC 3166
Phone : +61 3 8564 5000
NATA # 1261
Site # 1254 & 14271

Sydney
Unit F3, Building F
16 Mars Road
Lane Cove West NSW 2066
Phone : +61 2 9900 8400
NATA # 1261 Site # 18217

Brisbane
1/21 Smallwood Place
Murarrie QLD 4172
Phone : +61 7 3902 4600
NATA # 1261 Site # 20794

Perth
2/91 Leach Highway
Kewdale WA 6105
Phone : +61 8 9251 9600
NATA # 1261
Site # 18217

Company Name: GHD Pty Ltd NSW
Address: Level 15, 133 Castlereagh Street
Sydney
NSW 2000

Project Name: ALEXANDRIA
Project ID: 21-25583-03

Order No.:
Report #: 538199
Phone: 02 9239 7100
Fax: 02 9239 7199

Received: Mar 15, 2017 4:55 PM
Due: Mar 22, 2017
Priority: 5 Day
Contact Name: Ben Anderson

Eurofins | mgt Analytical Services Manager : Nibha Vaidya

Sample Detail						pH	pH (1:5 Aqueous extract)	Total Organic Carbon	Moisture Set	Eurofins | mgt Suite B7	Per- and Polyfluorinated Alkyl Substances (PFASs)
Melbourne Laboratory - NATA Site # 1254 & 14271						X		X			
Sydney Laboratory - NATA Site # 18217							X		X	X	
Brisbane Laboratory - NATA Site # 20794											X
Perth Laboratory - NATA Site # 18217											
External Laboratory											
No	**Sample ID**	**Sample Date**	**Sampling Time**	**Matrix**	**LAB ID**						
1	SPLIT 1	Mar 15, 2017		Water	S17-Ma17192	X		X		X	X
2	SPLIT 1	Mar 15, 2017		Soil	S17-Ma17193		X	X	X	X	X
Test Counts						1	1	2	1	2	2

Internal Quality Control Review and Glossary

General

1. Laboratory QC results for Method Blanks, Duplicates, Matrix Spikes, and Laboratory Control Samples are included in this QC report where applicable. Additional QC data may be available on request.
2. All soil results are reported on a dry basis, unless otherwise stated.
3. Actual LORs are matrix dependant. Quoted LORs may be raised where sample extracts are diluted due to interferences.
4. Results are uncorrected for matrix spikes or surrogate recoveries.
5. SVOC analysis on waters are performed on homogenised, unfiltered samples, unless noted otherwise.
6. Samples were analysed on an 'as received' basis. 7. This report replaces any interim results previously issued.

Holding Times

Please refer to 'Sample Preservation and Container Guide' for holding times (QS3001).

For samples received on the last day of holding time, notification of testing requirements should have been received at least 6 hours prior to sample receipt deadlines as stated on the Sample Receipt Advice.

If the Laboratory did not receive the information in the required timeframe, and regardless of any other integrity issues, suitably qualified results may still be reported.

Holding times apply from the date of sampling, therefore compliance to these may be outside the laboratory's control.

****NOTE:** pH duplicates are reported as a range NOT as RPD

Units

mg/kg: milligrams per Kilogram

ug/l: micrograms per litre

ppb: Parts per billion

org/100ml: Organisms per 100 millilitres

MPN/100mL: Most Probable Number of organisms per 100 millilitres

mg/l: milligrams per litre

ppm: Parts per million

%: Percentage

NTU: Nephelometric Turbidity Units

Terms

Dry	Where a moisture has been determined on a solid sample the result is expressed on a dry basis.
LOR	Limit of Reporting.
SPIKE	Addition of the analyte to the sample and reported as percentage recovery.
RPD	Relative Percent Difference between two Duplicate pieces of analysis.
LCS	Laboratory Control Sample - reported as percent recovery
CRM	Certified Reference Material - reported as percent recovery
Method Blank	In the case of solid samples these are performed on laboratory certified clean sands. In the case of water samples these are performed on de-ionised water.
Surr - Surrogate	The addition of a like compound to the analyte target and reported as percentage recovery.
Duplicate	A second piece of analysis from the same sample and reported in the same units as the result to show comparison.
Batch Duplicate	A second piece of analysis from a sample outside of the clients batch of samples but run within the laboratory batch of analysis.
Batch SPIKE	Spike recovery reported on a sample from outside of the clients batch of samples but run within the laboratory batch of analysis.
USEPA	United States Environmental Protection Agency
APHA	American Public Health Association
TCLP	Toxicity Characteristic Leaching Procedure
COC	Chain of Custody
SRA	Sample Receipt Advice
CP	Client Parent - QC was performed on samples pertaining to this report
NCP	Non-Client Parent - QC performed on samples not pertaining to this report, QC is representative of the sequence or batch that client samples were analysed within
TEQ	Toxic Equivalency Quotient

QC - Acceptance Criteria

RPD Duplicates: Global RPD Duplicates Acceptance Criteria is 30% however the following acceptance guidelines are equally applicable:

Results <10 times the LOR : No Limit

Results between 10-20 times the LOR : RPD must lie between 0-50%

Results >20 times the LOR : RPD must lie between 0-30%

Surrogate Recoveries: Recoveries must lie between 50-150%-Phenols & PFASs 20-130%

QC Data General Comments

1. Where a result is reported as a less than (<), higher than the nominated LOR, this is due to either matrix interference, extract dilution required due to interferences or contaminant levels within the sample, high moisture content or insufficient sample provided.
2. Duplicate data shown within this report that states the word "BATCH" is a Batch Duplicate from outside of your sample batch, but within the laboratory sample batch at a 1:10 ratio. The Parent and Duplicate data shown is not data from your samples.
3. Organochlorine Pesticide analysis - where reporting LCS data, Toxaphene & Chlordane are not added to the LCS.
4. Organochlorine Pesticide analysis - where reporting Spike data, Toxaphene is not added to the Spike.
5. Total Recoverable Hydrocarbons - where reporting Spike & LCS data, a single spike of commercial Hydrocarbon products in the range of C12-C30 is added and it's Total Recovery is reported in the C10-C14 cell of the Report.
6. pH and Free Chlorine analysed in the laboratory - Analysis on this test must begin within 30 minutes of sampling.Therefore laboratory analysis is unlikely to be completed within holding time. Analysis will begin as soon as possible after sample receipt.
7. Recovery Data (Spikes & Surrogates) - where chromatographic interference does not allow the determination of Recovery the term "INT" appears against that analyte.
8. Polychlorinated Biphenyls are spiked only using Aroclor 1260 in Matrix Spikes and LCS.
9. For Matrix Spikes and LCS results a dash " -" in the report means that the specific analyte was not added to the QC sample.
10. Duplicate RPDs are calculated from raw analytical data thus it is possible to have two sets of data.

Quality Control Results

Test	Units	Result 1			Acceptance Limits	Pass Limits	Qualifying Code
Method Blank							
Total Recoverable Hydrocarbons - 1999 NEPM Fractions							
TRH C6-C9	mg/L	< 0.02			0.02	Pass	
TRH C10-C14	mg/L	< 0.05			0.05	Pass	
TRH C15-C28	mg/L	< 0.1			0.1	Pass	
TRH C29-C36	mg/L	< 0.1			0.1	Pass	
Method Blank							
BTEX							
Benzene	mg/L	< 0.001			0.001	Pass	
Toluene	mg/L	< 0.001			0.001	Pass	
Ethylbenzene	mg/L	< 0.001			0.001	Pass	
m&p-Xylenes	mg/L	< 0.002			0.002	Pass	
o-Xylene	mg/L	< 0.001			0.001	Pass	
Xylenes - Total	mg/L	< 0.003			0.003	Pass	
Method Blank							
Total Recoverable Hydrocarbons - 2013 NEPM Fractions							
Naphthalene	mg/L	< 0.01			0.01	Pass	
TRH C6-C10	mg/L	< 0.02			0.02	Pass	
Method Blank							
Polycyclic Aromatic Hydrocarbons							
Acenaphthene	mg/L	< 0.001			0.001	Pass	
Acenaphthylene	mg/L	< 0.001			0.001	Pass	
Anthracene	mg/L	< 0.001			0.001	Pass	
Benz(a)anthracene	mg/L	< 0.001			0.001	Pass	
Benzo(a)pyrene	mg/L	< 0.001			0.001	Pass	
Benzo(b&j)fluoranthene	mg/L	< 0.001			0.001	Pass	
Benzo(g.h.i)perylene	mg/L	< 0.001			0.001	Pass	
Benzo(k)fluoranthene	mg/L	< 0.001			0.001	Pass	
Chrysene	mg/L	< 0.001			0.001	Pass	
Dibenz(a.h)anthracene	mg/L	< 0.001			0.001	Pass	
Fluoranthene	mg/L	< 0.001			0.001	Pass	
Fluorene	mg/L	< 0.001			0.001	Pass	
Indeno(1.2.3-cd)pyrene	mg/L	< 0.001			0.001	Pass	
Naphthalene	mg/L	< 0.001			0.001	Pass	
Phenanthrene	mg/L	< 0.001			0.001	Pass	
Pyrene	mg/L	< 0.001			0.001	Pass	
Method Blank							
Total Recoverable Hydrocarbons - 2013 NEPM Fractions							
TRH >C10-C16	mg/L	< 0.05			0.05	Pass	
TRH >C16-C34	mg/L	< 0.1			0.1	Pass	
TRH >C34-C40	mg/L	< 0.1			0.1	Pass	
Method Blank							
Perfluoroalkyl carboxylic acids (PFCAs)							
Perfluorobutanoic acid (PFBA)	ug/L	< 0.05			0.05	Pass	
Perfluoropentanoic acid (PFPeA)	ug/L	< 0.01			0.01	Pass	
Perfluorohexanoic acid (PFHxA)	ug/L	< 0.01			0.01	Pass	
Perfluoroheptanoic acid (PFHpA)	ug/L	< 0.01			0.01	Pass	
Perfluorooctanoic acid (PFOA)	ug/L	< 0.01			0.01	Pass	
Perfluorononanoic acid (PFNA)	ug/L	< 0.01			0.01	Pass	
Perfluorodecanoic acid (PFDA)	ug/L	< 0.01			0.01	Pass	
Perfluoroundecanoic acid (PFUnA)	ug/L	< 0.01			0.01	Pass	
Perfluorododecanoic acid (PFDoA)	ug/L	< 0.01			0.01	Pass	

Test	Units	Result 1			Acceptance Limits	Pass Limits	Qualifying Code
Perfluorotridecanoic acid (PFTrDA)	ug/L	< 0.01			0.01	Pass	
Perfluorotetradecanoic acid (PFTeDA)	ug/L	< 0.01			0.01	Pass	
Method Blank							
Perfluoroalkane sulfonamides (PFASAs)							
Perfluorooctane sulfonamide (FOSA)	ug/L	< 0.05			0.05	Pass	
N-methylperfluoro-1-octane sulfonamide (N-MeFOSA)	ug/L	< 0.05			0.05	Pass	
N-ethylperfluoro-1-octane sulfonamide (N-EtFOSA)	ug/L	< 0.05			0.05	Pass	
2-(N-methylperfluoro-1-octane sulfonamido)-ethanol (N-MeFOSE)	ug/L	< 0.05			0.05	Pass	
2-(N-ethylperfluoro-1-octane sulfonamido)-ethanol (N-EtFOSE)	ug/L	< 0.05			0.05	Pass	
N-ethyl-perfluorooctanesulfonamidoacetic acid (N-EtFOSAA)	ug/L	< 0.05			0.05	Pass	
N-methyl-perfluorooctanesulfonamidoacetic acid (N-MeFOSAA)	ug/L	< 0.05			0.05	Pass	
Method Blank							
Perfluoroalkane sulfonic acids & Perfluoroalkane sulfonates (PFSAs)							
Perfluorobutanesulfonic acid (PFBS)	ug/L	< 0.01			0.01	Pass	
Perfluoropentanesulfonic acid (PFPeS)	ug/L	< 0.01			0.01	Pass	
Perfluorohexanesulfonic acid (PFHxS)	ug/L	< 0.01			0.01	Pass	
Perfluoroheptanesulfonic acid (PFHpS)	ug/L	< 0.01			0.01	Pass	
Perfluorooctanesulfonic acid (PFOS)	ug/L	< 0.01			0.01	Pass	
Perfluorodecanesulfonic acid (PFDS)	ug/L	< 0.01			0.01	Pass	
Method Blank							
n:2 Fluorotelomer sulfonic acids							
1H.1H.2H.2H-perfluorohexanesulfonic acid (4:2 FTS)	ug/L	< 0.01			0.01	Pass	
1H.1H.2H.2H-perfluorooctanesulfonic acid (6:2 FTS)	ug/L	< 0.05			0.05	Pass	
1H.1H.2H.2H-perfluorodecanesulfonic acid (8:2 FTS)	ug/L	< 0.01			0.01	Pass	
1H.1H.2H.2H-perfluorododecanesulfonic acid (10:2 FTS)	ug/L	< 0.01			0.01	Pass	
Method Blank							
Total Organic Carbon	mg/L	< 5			5	Pass	
Method Blank							
Heavy Metals							
Arsenic	mg/L	< 0.001			0.001	Pass	
Cadmium	mg/L	< 0.0002			0.0002	Pass	
Chromium	mg/L	< 0.001			0.001	Pass	
Copper	mg/L	< 0.001			0.001	Pass	
Lead	mg/L	< 0.001			0.001	Pass	
Mercury	mg/L	< 0.0001			0.0001	Pass	
Nickel	mg/L	< 0.001			0.001	Pass	
Zinc	mg/L	< 0.005			0.005	Pass	
LCS - % Recovery							
Total Recoverable Hydrocarbons - 1999 NEPM Fractions							
TRH C6-C9	%	90			70-130	Pass	
TRH C10-C14	%	93			70-130	Pass	
LCS - % Recovery							
BTEX							
Benzene	%	82			70-130	Pass	
Toluene	%	82			70-130	Pass	
Ethylbenzene	%	81			70-130	Pass	
m&p-Xylenes	%	82			70-130	Pass	
o-Xylene	%	84			70-130	Pass	
Xylenes - Total	%	83			70-130	Pass	
LCS - % Recovery							
Total Recoverable Hydrocarbons - 2013 NEPM Fractions							
Naphthalene	%	74			70-130	Pass	
TRH C6-C10	%	79			70-130	Pass	
LCS - % Recovery							

Test	Units	Result 1			Acceptance Limits	Pass Limits	Qualifying Code
Polycyclic Aromatic Hydrocarbons							
Acenaphthene	%	127			70-130	Pass	
Acenaphthylene	%	101			70-130	Pass	
Anthracene	%	108			70-130	Pass	
Benz(a)anthracene	%	102			70-130	Pass	
Benzo(a)pyrene	%	106			70-130	Pass	
Benzo(b&j)fluoranthene	%	99			70-130	Pass	
Benzo(g.h.i)perylene	%	114			70-130	Pass	
Benzo(k)fluoranthene	%	108			70-130	Pass	
Chrysene	%	122			70-130	Pass	
Dibenz(a.h)anthracene	%	108			70-130	Pass	
Fluoranthene	%	113			70-130	Pass	
Fluorene	%	113			70-130	Pass	
Indeno(1.2.3-cd)pyrene	%	116			70-130	Pass	
Naphthalene	%	122			70-130	Pass	
Phenanthrene	%	121			70-130	Pass	
Pyrene	%	113			70-130	Pass	
LCS - % Recovery							
Total Recoverable Hydrocarbons - 2013 NEPM Fractions							
TRH >C10-C16	%	94			70-130	Pass	
LCS - % Recovery							
Perfluoroalkyl carboxylic acids (PFCAs)							
Perfluorobutanoic acid (PFBA)	%	113			50-150	Pass	
Perfluoropentanoic acid (PFPeA)	%	119			50-150	Pass	
Perfluorohexanoic acid (PFHxA)	%	116			50-150	Pass	
Perfluoroheptanoic acid (PFHpA)	%	118			50-150	Pass	
Perfluorooctanoic acid (PFOA)	%	116			50-150	Pass	
Perfluorononanoic acid (PFNA)	%	120			50-150	Pass	
Perfluorodecanoic acid (PFDA)	%	118			50-150	Pass	
Perfluoroundecanoic acid (PFUnA)	%	114			50-150	Pass	
Perfluorododecanoic acid (PFDoA)	%	119			50-150	Pass	
Perfluorotridecanoic acid (PFTrDA)	%	117			50-150	Pass	
Perfluorotetradecanoic acid (PFTeDA)	%	121			50-150	Pass	
LCS - % Recovery							
Perfluoroalkane sulfonamides (PFASAs)							
Perfluorooctane sulfonamide (FOSA)	%	120			50-150	Pass	
N-methylperfluoro-1-octane sulfonamide (N-MeFOSA)	%	120			50-150	Pass	
N-ethylperfluoro-1-octane sulfonamide (N-EtFOSA)	%	142			50-150	Pass	
2-(N-methylperfluoro-1-octane sulfonamido)-ethanol (N-MeFOSE)	%	139			50-150	Pass	
2-(N-ethylperfluoro-1-octane sulfonamido)-ethanol (N-EtFOSE)	%	135			50-150	Pass	
N-ethyl-perfluorooctanesulfonamidoacetic acid (N-EtFOSAA)	%	117			50-150	Pass	
N-methyl-perfluorooctanesulfonamidoacetic acid (N-MeFOSAA)	%	119			50-150	Pass	
LCS - % Recovery							
Perfluoroalkane sulfonic acids & Perfluoroalkane sulfonates (PFSAs)							
Perfluorobutanesulfonic acid (PFBS)	%	107			50-150	Pass	
Perfluoropentanesulfonic acid (PFPeS)	%	116			50-150	Pass	
Perfluorohexanesulfonic acid (PFHxS)	%	113			50-150	Pass	
Perfluoroheptanesulfonic acid (PFHpS)	%	132			50-150	Pass	
Perfluorooctanesulfonic acid (PFOS)	%	114			50-150	Pass	
Perfluorodecanesulfonic acid (PFDS)	%	118			50-150	Pass	
LCS - % Recovery							
n:2 Fluorotelomer sulfonic acids							
1H.1H.2H.2H-perfluorohexanesulfonic acid (4:2 FTS)	%	113			50-150	Pass	
1H.1H.2H.2H-perfluorooctanesulfonic acid (6:2 FTS)	%	105			50-150	Pass	

Test			Units	Result 1			Acceptance Limits	Pass Limits	Qualifying Code
1H.1H.2H.2H-perfluorodecanesulfonic acid (8:2 FTS)			%	113			50-150	Pass	
1H.1H.2H.2H-perfluorododecanesulfonic acid (10:2 FTS)			%	116			50-150	Pass	
LCS - % Recovery									
Total Organic Carbon			%	107			70-130	Pass	
LCS - % Recovery									
Heavy Metals									
Arsenic			%	99			70-130	Pass	
Cadmium			%	94			70-130	Pass	
Chromium			%	99			70-130	Pass	
Copper			%	102			70-130	Pass	
Lead			%	101			70-130	Pass	
Mercury			%	95			70-130	Pass	
Nickel			%	99			70-130	Pass	
Zinc			%	104			70-130	Pass	
Test	**Lab Sample ID**	**QA Source**	**Units**	**Result 1**			**Acceptance Limits**	**Pass Limits**	**Qualifying Code**
Spike - % Recovery									
Total Recoverable Hydrocarbons - 1999 NEPM Fractions				Result 1					
TRH C6-C9	S17-Ma19164	NCP	%	85			70-130	Pass	
TRH C10-C14	S17-Ma21380	NCP	%	123			70-130	Pass	
Spike - % Recovery									
BTEX				Result 1					
Benzene	S17-Ma19164	NCP	%	84			70-130	Pass	
Toluene	S17-Ma19164	NCP	%	87			70-130	Pass	
Ethylbenzene	S17-Ma19164	NCP	%	86			70-130	Pass	
m&p-Xylenes	S17-Ma19164	NCP	%	85			70-130	Pass	
o-Xylene	S17-Ma19164	NCP	%	93			70-130	Pass	
Xylenes - Total	S17-Ma19164	NCP	%	87			70-130	Pass	
Spike - % Recovery									
Total Recoverable Hydrocarbons - 2013 NEPM Fractions				Result 1					
Naphthalene	S17-Ma19164	NCP	%	89			70-130	Pass	
TRH C6-C10	S17-Ma19164	NCP	%	84			70-130	Pass	
Spike - % Recovery									
Polycyclic Aromatic Hydrocarbons				Result 1					
Acenaphthene	S17-Ma21381	NCP	%	82			70-130	Pass	
Acenaphthylene	S17-Ma21381	NCP	%	79			70-130	Pass	
Anthracene	S17-Ma21381	NCP	%	88			70-130	Pass	
Benz(a)anthracene	S17-Ma21381	NCP	%	71			70-130	Pass	
Benzo(a)pyrene	S17-Ma21381	NCP	%	73			70-130	Pass	
Benzo(b&j)fluoranthene	S17-Ma21381	NCP	%	70			70-130	Pass	
Benzo(g.h.i)perylene	S17-Ma21381	NCP	%	81			70-130	Pass	
Benzo(k)fluoranthene	S17-Ma21381	NCP	%	73			70-130	Pass	
Chrysene	S17-Ma21381	NCP	%	79			70-130	Pass	
Dibenz(a.h)anthracene	S17-Ma21381	NCP	%	77			70-130	Pass	
Fluoranthene	S17-Ma21381	NCP	%	86			70-130	Pass	
Fluorene	S17-Ma21381	NCP	%	72			70-130	Pass	
Indeno(1.2.3-cd)pyrene	S17-Ma21381	NCP	%	72			70-130	Pass	
Naphthalene	S17-Ma21381	NCP	%	90			70-130	Pass	
Phenanthrene	S17-Ma21381	NCP	%	90			70-130	Pass	
Pyrene	S17-Ma21381	NCP	%	84			70-130	Pass	
Spike - % Recovery									
Total Recoverable Hydrocarbons - 2013 NEPM Fractions				Result 1					
TRH >C10-C16	S17-Ma21380	NCP	%	121			70-130	Pass	
Spike - % Recovery									
Perfluoroalkyl carboxylic acids (PFCAs)				Result 1					

Test	Lab Sample ID	QA Source	Units	Result 1			Acceptance Limits	Pass Limits	Qualifying Code
Perfluorobutanoic acid (PFBA)	M17-Ma16973	NCP	%	110			50-150	Pass	
Perfluoropentanoic acid (PFPeA)	M17-Ma16973	NCP	%	120			50-150	Pass	
Perfluorohexanoic acid (PFHxA)	M17-Ma16973	NCP	%	110			50-150	Pass	
Perfluoroheptanoic acid (PFHpA)	M17-Ma16973	NCP	%	105			50-150	Pass	
Perfluorooctanoic acid (PFOA)	M17-Ma16973	NCP	%	113			50-150	Pass	
Perfluorononanoic acid (PFNA)	M17-Ma16973	NCP	%	112			50-150	Pass	
Perfluorodecanoic acid (PFDA)	M17-Ma16973	NCP	%	116			50-150	Pass	
Perfluoroundecanoic acid (PFUnA)	M17-Ma16973	NCP	%	115			50-150	Pass	
Perfluorododecanoic acid (PFDoA)	M17-Ma16973	NCP	%	107			50-150	Pass	
Perfluorotridecanoic acid (PFTrDA)	M17-Ma16973	NCP	%	108			50-150	Pass	
Perfluorotetradecanoic acid (PFTeDA)	M17-Ma16973	NCP	%	125			50-150	Pass	
Spike - % Recovery									
Perfluoroalkane sulfonamides (PFASAs)				Result 1					
Perfluorooctane sulfonamide (FOSA)	M17-Ma16973	NCP	%	118			50-150	Pass	
N-methylperfluoro-1-octane sulfonamide (N-MeFOSA)	M17-Ma16973	NCP	%	125			50-150	Pass	
N-ethylperfluoro-1-octane sulfonamide (N-EtFOSA)	M17-Ma16973	NCP	%	132			50-150	Pass	
2-(N-methylperfluoro-1-octane sulfonamido)-ethanol (N-MeFOSE)	M17-Ma16973	NCP	%	140			50-150	Pass	
2-(N-ethylperfluoro-1-octane sulfonamido)-ethanol (N-EtFOSE)	M17-Ma16973	NCP	%	140			50-150	Pass	
N-ethyl-perfluorooctanesulfonamidoacetic acid (N-EtFOSAA)	M17-Ma16973	NCP	%	135			50-150	Pass	
N-methyl-perfluorooctanesulfonamidoacetic acid (N-MeFOSAA)	M17-Ma16973	NCP	%	117			50-150	Pass	
Spike - % Recovery									
Perfluoroalkane sulfonic acids & Perfluoroalkane sulfonates (PFSAs)				Result 1					
Perfluorobutanesulfonic acid (PFBS)	M17-Ma16973	NCP	%	109			50-150	Pass	
Perfluoropentanesulfonic acid (PFPeS)	M17-Ma16973	NCP	%	112			50-150	Pass	
Perfluorohexanesulfonic acid (PFHxS)	M17-Ma16973	NCP	%	113			50-150	Pass	
Perfluoroheptanesulfonic acid (PFHpS)	M17-Ma16973	NCP	%	134			50-150	Pass	
Perfluorooctanesulfonic acid (PFOS)	M17-Ma16973	NCP	%	112			50-150	Pass	
Perfluorodecanesulfonic acid (PFDS)	M17-Ma16973	NCP	%	115			50-150	Pass	
Spike - % Recovery									
n:2 Fluorotelomer sulfonic acids				Result 1					
1H.1H.2H.2H-perfluorohexanesulfonic acid (4:2 FTS)	M17-Ma16973	NCP	%	110			50-150	Pass	
1H.1H.2H.2H-perfluorooctanesulfonic acid (6:2 FTS)	M17-Ma16973	NCP	%	106			50-150	Pass	
1H.1H.2H.2H-perfluorodecanesulfonic acid (8:2 FTS)	M17-Ma16973	NCP	%	109			50-150	Pass	
1H.1H.2H.2H-perfluorododecanesulfonic acid (10:2 FTS)	M17-Ma16973	NCP	%	125			50-150	Pass	
Spike - % Recovery									
Heavy Metals				Result 1					
Arsenic	P17-Ma19254	NCP	%	97			70-130	Pass	
Cadmium	P17-Ma19254	NCP	%	92			70-130	Pass	

Test	Lab Sample ID	QA Source	Units	Result 1			Acceptance Limits	Pass Limits	Qualifying Code
Chromium	P17-Ma19254	NCP	%	96			70-130	Pass	
Copper	P17-Ma19254	NCP	%	96			70-130	Pass	
Lead	P17-Ma19254	NCP	%	100			70-130	Pass	
Mercury	P17-Ma19254	NCP	%	105			70-130	Pass	
Nickel	P17-Ma19254	NCP	%	96			70-130	Pass	
Zinc	P17-Ma19254	NCP	%	89			70-130	Pass	
Test	**Lab Sample ID**	**QA Source**	**Units**	**Result 1**			**Acceptance Limits**	**Pass Limits**	**Qualifying Code**
Duplicate									
Total Recoverable Hydrocarbons - 1999 NEPM Fractions				Result 1	Result 2	RPD			
TRH C6-C9	S17-Ma17737	NCP	mg/L	< 0.02	< 0.02	<1	30%	Pass	
TRH C10-C14	S17-Ma21379	NCP	mg/L	< 0.05	< 0.05	<1	30%	Pass	
TRH C15-C28	S17-Ma21379	NCP	mg/L	< 0.1	< 0.1	<1	30%	Pass	
TRH C29-C36	S17-Ma21379	NCP	mg/L	< 0.1	< 0.1	<1	30%	Pass	
Duplicate									
BTEX				Result 1	Result 2	RPD			
Benzene	S17-Ma17737	NCP	mg/L	< 0.001	< 0.001	<1	30%	Pass	
Toluene	S17-Ma17737	NCP	mg/L	< 0.001	< 0.001	<1	30%	Pass	
Ethylbenzene	S17-Ma17737	NCP	mg/L	< 0.001	< 0.001	<1	30%	Pass	
m&p-Xylenes	S17-Ma17737	NCP	mg/L	< 0.002	< 0.002	<1	30%	Pass	
o-Xylene	S17-Ma17737	NCP	mg/L	< 0.001	< 0.001	<1	30%	Pass	
Xylenes - Total	S17-Ma17737	NCP	mg/L	< 0.003	< 0.003	<1	30%	Pass	
Duplicate									
Total Recoverable Hydrocarbons - 2013 NEPM Fractions				Result 1	Result 2	RPD			
Naphthalene	S17-Ma17737	NCP	mg/L	< 0.01	< 0.01	<1	30%	Pass	
TRH C6-C10	S17-Ma17737	NCP	mg/L	< 0.02	< 0.02	<1	30%	Pass	
Duplicate									
Polycyclic Aromatic Hydrocarbons				Result 1	Result 2	RPD			
Acenaphthene	S17-Ma21379	NCP	mg/L	< 0.001	< 0.001	<1	30%	Pass	
Acenaphthylene	S17-Ma21379	NCP	mg/L	< 0.001	< 0.001	<1	30%	Pass	
Anthracene	S17-Ma21379	NCP	mg/L	< 0.001	< 0.001	<1	30%	Pass	
Benz(a)anthracene	S17-Ma21379	NCP	mg/L	< 0.001	< 0.001	<1	30%	Pass	
Benzo(a)pyrene	S17-Ma21379	NCP	mg/L	< 0.001	< 0.001	<1	30%	Pass	
Benzo(b&j)fluoranthene	S17-Ma21379	NCP	mg/L	< 0.001	< 0.001	<1	30%	Pass	
Benzo(g.h.i)perylene	S17-Ma21379	NCP	mg/L	< 0.001	< 0.001	<1	30%	Pass	
Benzo(k)fluoranthene	S17-Ma21379	NCP	mg/L	< 0.001	< 0.001	<1	30%	Pass	
Chrysene	S17-Ma21379	NCP	mg/L	< 0.001	< 0.001	<1	30%	Pass	
Dibenz(a.h)anthracene	S17-Ma21379	NCP	mg/L	< 0.001	< 0.001	<1	30%	Pass	
Fluoranthene	S17-Ma21379	NCP	mg/L	< 0.001	< 0.001	<1	30%	Pass	
Fluorene	S17-Ma21379	NCP	mg/L	< 0.001	< 0.001	<1	30%	Pass	
Indeno(1.2.3-cd)pyrene	S17-Ma21379	NCP	mg/L	< 0.001	< 0.001	<1	30%	Pass	
Naphthalene	S17-Ma21379	NCP	mg/L	< 0.001	< 0.001	<1	30%	Pass	
Phenanthrene	S17-Ma21379	NCP	mg/L	< 0.001	< 0.001	<1	30%	Pass	
Pyrene	S17-Ma21379	NCP	mg/L	< 0.001	< 0.001	<1	30%	Pass	
Duplicate									
Total Recoverable Hydrocarbons - 2013 NEPM Fractions				Result 1	Result 2	RPD			
TRH >C10-C16	S17-Ma21379	NCP	mg/L	< 0.05	< 0.05	<1	30%	Pass	
TRH >C16-C34	S17-Ma21379	NCP	mg/L	< 0.1	< 0.1	<1	30%	Pass	
TRH >C34-C40	S17-Ma21379	NCP	mg/L	< 0.1	< 0.1	<1	30%	Pass	
Duplicate									
Perfluoroalkyl carboxylic acids (PFCAs)				Result 1	Result 2	RPD			
Perfluorobutanoic acid (PFBA)	M17-Ma16227	NCP	ug/L	< 0.05	< 0.05	<1	30%	Pass	
Perfluoropentanoic acid (PFPeA)	M17-Ma16227	NCP	ug/L	< 0.01	< 0.01	<1	30%	Pass	
Perfluorohexanoic acid (PFHxA)	M17-Ma16227	NCP	ug/L	< 0.01	< 0.01	<1	30%	Pass	
Perfluoroheptanoic acid (PFHpA)	M17-Ma16227	NCP	ug/L	< 0.01	< 0.01	<1	30%	Pass	

Duplicate									
Perfluoroalkyl carboxylic acids (PFCAs)				Result 1	Result 2	RPD			
Perfluorooctanoic acid (PFOA)	M17-Ma16227	NCP	ug/L	< 0.01	< 0.01	<1	30%	Pass	
Perfluorononanoic acid (PFNA)	M17-Ma16227	NCP	ug/L	< 0.01	< 0.01	<1	30%	Pass	
Perfluorodecanoic acid (PFDA)	M17-Ma16227	NCP	ug/L	< 0.01	< 0.01	<1	30%	Pass	
Perfluoroundecanoic acid (PFUnA)	M17-Ma16227	NCP	ug/L	< 0.01	< 0.01	<1	30%	Pass	
Perfluorododecanoic acid (PFDoA)	M17-Ma16227	NCP	ug/L	< 0.01	< 0.01	<1	30%	Pass	
Perfluorotridecanoic acid (PFTrDA)	M17-Ma16227	NCP	ug/L	< 0.01	< 0.01	<1	30%	Pass	
Perfluorotetradecanoic acid (PFTeDA)	M17-Ma16227	NCP	ug/L	< 0.01	< 0.01	<1	30%	Pass	
Duplicate									
Perfluoroalkane sulfonamides (PFASAs)				Result 1	Result 2	RPD			
Perfluorooctane sulfonamide (FOSA)	M17-Ma16227	NCP	ug/L	< 0.05	< 0.05	<1	30%	Pass	
N-methylperfluoro-1-octane sulfonamide (N-MeFOSA)	M17-Ma16227	NCP	ug/L	< 0.05	< 0.05	<1	30%	Pass	
N-ethylperfluoro-1-octane sulfonamide (N-EtFOSA)	M17-Ma16227	NCP	ug/L	< 0.05	< 0.05	<1	30%	Pass	
2-(N-methylperfluoro-1-octane sulfonamido)-ethanol (N-MeFOSE)	M17-Ma16227	NCP	ug/L	< 0.05	< 0.05	<1	30%	Pass	
2-(N-ethylperfluoro-1-octane sulfonamido)-ethanol (N-EtFOSE)	M17-Ma16227	NCP	ug/L	< 0.05	< 0.05	<1	30%	Pass	
N-ethyl-perfluorooctanesulfonamidoacetic acid (N-EtFOSAA)	M17-Ma16227	NCP	ug/L	< 0.05	< 0.05	<1	30%	Pass	
N-methyl-perfluorooctanesulfonamidoacetic acid (N-MeFOSAA)	M17-Ma16227	NCP	ug/L	< 0.05	< 0.05	<1	30%	Pass	
Duplicate									
Perfluoroalkane sulfonic acids & Perfluoroalkane sulfonates (PFSAs)				Result 1	Result 2	RPD			
Perfluorobutanesulfonic acid (PFBS)	M17-Ma16227	NCP	ug/L	< 0.01	< 0.01	<1	30%	Pass	
Perfluoropentanesulfonic acid (PFPeS)	M17-Ma16227	NCP	ug/L	< 0.01	< 0.01	<1	30%	Pass	
Perfluorohexanesulfonic acid (PFHxS)	M17-Ma16227	NCP	ug/L	< 0.01	< 0.01	<1	30%	Pass	
Perfluoroheptanesulfonic acid (PFHpS)	M17-Ma16227	NCP	ug/L	< 0.01	< 0.01	<1	30%	Pass	
Perfluorooctanesulfonic acid (PFOS)	M17-Ma16227	NCP	ug/L	< 0.01	< 0.01	<1	30%	Pass	
Perfluorodecanesulfonic acid (PFDS)	M17-Ma16227	NCP	ug/L	< 0.01	< 0.01	<1	30%	Pass	
Duplicate									
n:2 Fluorotelomer sulfonic acids				Result 1	Result 2	RPD			
1H.1H.2H.2H-perfluorohexanesulfonic acid (4:2 FTS)	M17-Ma16227	NCP	ug/L	< 0.01	< 0.01	<1	30%	Pass	
1H.1H.2H.2H-perfluorooctanesulfonic acid (6:2 FTS)	M17-Ma16227	NCP	ug/L	< 0.05	< 0.05	<1	30%	Pass	
1H.1H.2H.2H-perfluorodecanesulfonic acid (8:2 FTS)	M17-Ma16227	NCP	ug/L	< 0.01	< 0.01	<1	30%	Pass	
1H.1H.2H.2H-perfluorododecanesulfonic acid (10:2 FTS)	M17-Ma16227	NCP	ug/L	< 0.01	< 0.01	<1	30%	Pass	
Duplicate									
				Result 1	Result 2	RPD			
pH	B17-Ma16840	NCP	pH Units	7.2	7.3	pass	30%	Pass	
Total Organic Carbon	M17-Ma18852	NCP	mg/L	30	30	<1	30%	Pass	

Duplicate									
Heavy Metals				Result 1	Result 2	RPD			
Arsenic	P17-Ma19253	NCP	mg/L	0.001	0.001	4.0	30%	Pass	
Cadmium	P17-Ma19253	NCP	mg/L	< 0.0002	< 0.0002	<1	30%	Pass	
Chromium	P17-Ma19253	NCP	mg/L	0.001	0.001	6.0	30%	Pass	
Copper	P17-Ma19263	NCP	mg/L	0.003	0.003	2.0	30%	Pass	
Lead	P17-Ma19253	NCP	mg/L	< 0.001	< 0.001	<1	30%	Pass	
Mercury	P17-Ma19253	NCP	mg/L	< 0.0001	< 0.0001	<1	30%	Pass	
Nickel	P17-Ma19263	NCP	mg/L	0.002	< 0.001	110	30%	Fail	Q15
Zinc	P17-Ma19263	NCP	mg/L	0.014	0.012	10	30%	Pass	

Comments

Sample Integrity

Custody Seals Intact (if used)	N/A
Attempt to Chill was evident	Yes
Sample correctly preserved	Yes
Appropriate sample containers have been used	Yes
Sample containers for volatile analysis received with minimal headspace	Yes
Samples received within HoldingTime	Yes
Some samples have been subcontracted	No

Qualifier Codes/Comments

Code	Description
N01	F2 is determined by arithmetically subtracting the "naphthalene" value from the ">C10-C16" value. The naphthalene value used in this calculation is obtained from volatiles (Purge & Trap analysis).
N02	Where we have reported both volatile (P&T GCMS) and semivolatile (GCMS) naphthalene data, results may not be identical. Provided correct sample handling protocols have been followed, any observed differences in results are likely to be due to procedural differences within each methodology. Results determined by both techniques have passed all QAQC acceptance criteria, and are entirely technically valid.
N04	F1 is determined by arithmetically subtracting the "Total BTEX" value from the "C6-C10" value. The "Total BTEX" value is obtained by summing the concentrations of BTEX analytes. The "C6-C10" value is obtained by quantitating against a standard of mixed aromatic/aliphatic analytes.
N07	Please note:- These two PAH isomers closely co-elute using the most contemporary analytical methods and both the reported concentration (and the TEQ) apply specifically to the total of the two co-eluting PAHs
N09	Quantification of linear and branched isomers has been conducted as a single total response using the relative response factor for the corresponding linear/branched standard.
N11	Isotope dilution is used for calibration of each native compound for which an exact labelled analogue is available (Isotope Dilution Quantitation). The isotopically labelled analogues allow identification and recovery correction of the concentration of the associated native PFAS compounds. Where the native PFAS compound does not have labelled analogue then the quantification is made using the Extracted Internal Standard Analyte with the closest retention time to the analyte and no recovery correction has been made (Internal Standard Quantitation).
Q15	The RPD reported passes Eurofins | mgt's QC - Acceptance Criteria as defined in the Internal Quality Control Review and Glossary page of this report.

Authorised By

Nibha Vaidya	Analytical Services Manager
Huong Le	Senior Analyst-Inorganic (VIC)
Jonathon Angell	Senior Analyst-Organic (QLD)
Ryan Hamilton	Senior Analyst-Metal (NSW)
Ryan Hamilton	Senior Analyst-Organic (NSW)
Ryan Hamilton	Senior Analyst-Volatile (NSW)

Glenn Jackson

National Operations Manager

Final report - this Report replaces any previously issued Report

- Indicates Not Requested

* Indicates NATA accreditation does not cover the performance of this service

Measurement uncertainty of test data is available on request or please click here.

Melbourne
3-5 Kingston Town Close
Oakleigh Vic 3166
Phone : +61 3 8564 5000
NATA # 1261
Site # 1254 & 14271

Sydney
Unit F3, Building F
16 Mars Road
Lane Cove West NSW 2066
Phone : +61 2 9900 8400
NATA # 1261 Site # 18217

Brisbane
1/21 Smallwood Place
Murarrie QLD 4172
Phone : +61 7 3902 4600
NATA # 1261 Site # 20794

Perth
2/91 Leach Highway
Kewdale WA 6105
Phone : +61 8 9251 9600
NATA # 1261 Site # 18217

ABN – 50 005 085 521 e.mail : EnviroSales@eurofins.com web : www.eurofins.com.au

Sample Receipt Advice

Company name:	**GHD Pty Ltd NSW**
Contact name:	Ben Anderson
Project name:	ALEXANDRIA
Project ID:	21-25583-03
COC number:	Not provided
Turn around time:	5 Day
Date/Time received:	Mar 15, 2017 4:55 PM
Eurofins | mgt reference:	**538199**

Sample information

☑ A detailed list of analytes logged into our LIMS, is included in the attached summary table.

☑ Sample Temperature of a random sample selected from the batch as recorded by Eurofins | mgt Sample Receipt : 3.3 degrees Celsius.

☑ All samples have been received as described on the above COC.

☑ COC has been completed correctly.

☑ Attempt to chill was evident.

☑ Appropriately preserved sample containers have been used.

☑ All samples were received in good condition.

☑ Samples have been provided with adequate time to commence analysis in accordance with the relevant holding times.

☑ Appropriate sample containers have been used.

☑ Sample containers for volatile analysis received with zero headspace.

☒ Some samples have been subcontracted.

N/A Custody Seals intact (if used).

Contact notes

If you have any questions with respect to these samples please contact:

Nibha Vaidya on Phone : +61 (2) 9900 8400 or by e.mail: NibhaVaidya@eurofins.com

Results will be delivered electronically via e.mail to Ben Anderson - ben.anderson@ghd.com.

eurofins | mgt

☑ **Sydney**
Unit F3 - 6 Building F, 16 Mars Road, Lane Cove
Phone: +612 9900 8400
Email: enviro.syd@mgtlabmark.com.au

☐ **Brisbane**
Unit 1-21 Smallwood Place, Murrarie
Phone: +617 3902 4600
Email: enviro.bris@mgtlabmark.com.au

☐ **Melbourne**
2 Kingston Town Close, Oakleigh, VIC 3166
Phone +613 8564 5000 Fax +613 8564 5090
Email: enquiries.melb@mgtlabmark.com.au

CHAIN OF CUSTODY RECORD

CLIENT DETAILS

Company Name : GHD Pty Ltd, Sydney	**Contact Name :** Terry Nham	**Purchase Order :**	**COC Number :**
Office Address : Level 15, 133 Castlereagh Street, Sydney NSW 2000	**Project Manager :** Ben Anderson	**PROJECT Number :** 21-25583-03	**Eurofins | mgt quote ID :** GHD Rates 2016
	Email for results : terry.nham@ghd.com ben.anderson@ghd.com	**PROJECT Name :** Alexandria	**Data output format:** ESDAT

Special Directions & Comments :

Eurofins | mgt DI water batch number:

	Sample ID	Date	Matrix	PFOS/PFOA	TRH, BTEX, PAH, 8M (Suite B7)	TOC	PH	CEC	TDS	Major Cations	Alkalinity																				
1	[illegible]	15.3.17	W	X	X	X	X																								
2	[illegible]	15.3.17	Sed	X	X	X	X																								
3																															
4																															
5																															
6																															
7																															
8																															
9																															
10																															
11																															
12																															
13																															
14																															
15																															
16																															

Some common holding times (with correct preservation). For further information contact the lab

Waters		Soils	
BTEX, MAH, VOC	14 days	BTEX, MAH, VOC	14 days
TRH, PAH, Phenols, Pesticides	7 days	TRH, PAH, Phenols, Pesticides	14 days
Heavy Metals	6 months	Heavy Metals	6 months
Mercury, CrVI	28 days	Mercury, CrVI	28 days
Microbiological testing	24 hours	Microbiological testing	72 hours
BOD, Nitrate, Nitrite, Total N	2 days	Anions	28 days
Solids - TSS, TDS etc	7 days	SPOCAS, pH Field and FOX, CrS	24 hours
Ferrous iron	7 days	ASLP, TCLP	7 days

Containers:

1LP	250P	125P	1LA	40mL vial	125mL A	Jar	Bag
X		X		X			
						2x	

Sample comments:

Relinquished By: ~~Terry Nham~~ - GHD DYLAN GALE
Date & Time : 15.3.17 / 15:00
Signature:

Laboratory Staff
Received By: [illegible]
Date & Time 15/3/17 16:55
Signature:

Turn around time
1 DAY ☐ 2 DAY ☐ 3 DAY ☐
5 DAY ☑ 10 DAY ☐ Other:

Method Of Shipment
☒ Courier
☒ Hand Delivered
☐ Postal
Courier Consignment # :

Temperature on arrival:

Report number: 538199

Appendix E – Assessment of data quality

Quality Assurance and Quality Control Report

Data Quality Indicators

Data generated during this investigation must be appropriate to allow decisions to be made with confidence. Specific limits for this investigation have been adopted in accordance with guidance from the AS4482.1 which includes appropriate indicators of data quality (data quality indicators [DQIs] used to assess QA/QC, and GHD's Standard Field Operating Procedures).

To assess the usability of the data prior to making decisions, the data is assessed against pre-determined DQIs. The DQIs including precision, accuracy, representativeness, comparability and completeness, will be reviewed at the completion of the investigation works to assess for the presence of decision errors.

The pre-determined DQIs established for the investigation are discussed below and shown in Table 1.

- Precision - measures the reproducibility of measurements under a given set of conditions. The precision of the laboratory data and sampling techniques is assessed by calculating the Relative Percentage Difference (RPD) of duplicate samples.
- Accuracy - measures the bias in a measurement system. The accuracy of the laboratory data that are generated during this investigation is a measure of the closeness of the analytical results obtained by a method to the 'true' (or standard) value. Accuracy is assessed by reference to the analytical results of laboratory control samples, laboratory spikes and analyses against reference standards.
- Representativeness - expresses the degree to which sample data accurately and precisely represent a characteristic of a population or an environmental condition. Representativeness is achieved by collecting samples on a representative basis across the site, and by using an adequate number of sample locations to characterise the site to the required accuracy.
- Comparability - expresses the confidence with which one data set can be compared with another. This is achieved through maintaining a level of consistency in techniques used to collect samples; ensuring analysing laboratories use consistent analysis techniques and reporting methods.
- Completeness - is defined as the percentage of measurements made which are judged to be valid measurements.

Table 1 Summary of quality assurance / quality control criteria for surface water

Data quality indicator	Frequency	Data quality acceptance criteria
Precision		
Inter/ intra duplicates	1 / 10 samples	<30-50% RPD
Accuracy		
Surrogate spikes Laboratory control samples Matrix spikes	All organic samples 1 per lab batch 1 per lab batch	70-130% <LOR 70-130%
Representativeness		
Sampling appropriate for media and analytes	All samples	- Organics (7-14 days)

Data quality indicator	Frequency	Data quality acceptance criteria
Samples extracted and analysed within holding times	All samples	Analyte specific
LORs appropriate and consistent	All samples	All samples
Comparability		
Consistent field conditions, sampling staff and laboratory analysis	All samples	All samples
Standard operating procedures for sample collection & handling	All samples	All samples
Standard analytical methods used for all analyses	All samples	All samples
Completeness		
Sample description and COCs completed and appropriate	All Samples	All Samples
Appropriate documentation	All Samples	All Samples
Satisfactory frequency and result for QA/QC samples	All QA/QC samples	-
Data from critical samples is considered valid	-	Critical samples valid
Acronyms COC: Chain of Custody LOR: Limit of Reporting QA/QC: Quality assurance / quality control		

If any of the DQIs are not met, further investigation will be necessary to determine whether the non-conformance will significantly affect the usefulness of the data.

Field quality assurance and quality control

The quality assurance/quality control (QA/QC) procedures are based on NSW EPA *Guidelines for the Site Auditor Scheme* (2006) and AS 4482.1 – 2005 and AS 4482.2 – 1999.

QA involves all the actions, procedures, checks and decisions undertaken to ensure the representativeness and integrity of samples and accuracy and reliability of analytical results (NEPC 2013). QC involves protocols to monitor and measure the effectiveness of QA procedures.

All fieldwork was conducted with reference to the Australian Standards AS 4482.1 – 2005 and AS 4482.2 – 1999 and GHD's Standard Field Operating Procedures which ensure all samples are collected by a set of uniform and systematic methods, as required by GHD's QA system. Key requirements of these procedures are listed below:

- Decontamination procedures – including washing and rinsing of re-useable equipment, the use of new disposable gloves and sampling tubing between each sampling location and the use of sampling containers provided by the laboratory.
- Sample identification procedures - samples were immediately transferred to sample containers of appropriate composition and preservation for the required laboratory analysis. All sample containers were clearly labelled with a sample number, job number, and sample date. The sample containers were then transferred to a chilled insulated container for sample preservation prior to and during shipment to the analytical laboratory.
- Chain of custody information requirements - a chain of custody form was completed and forwarded to the testing laboratory with the samples.

- Inter and intra duplicate and sample frequency.
- Calibration was undertaken by the rental supplier and certificates are provided in Appendix F.

Surface water and sediment sampling, and analysis quality control

The QC samples collected during the investigation are described below.

- Intra laboratory duplicate: Intra duplicates are used to identify the variation in the analyte concentration between samples from the same sampling point and the repeatability of the laboratory's analysis.
- Inter laboratory duplicate: Inter duplicates provide an indication of the repeatability of the results between laboratories.

Table 2 Quality control (QC) sampling frequency

Sample	Recommended sampling rate	Media	No. QC samples	No. of primary samples	Total
Intra	1/10 samples	Water	1	5	7
Inter	1/10 samples		1		
Intra	1/10 samples	Sediment	1	3	5
Inter	1/10 samples		1		

All quality control sampling frequency criteria were met during this investigation.

Relative percentage difference calculations

Relative percentage difference (RPD) calculations are used to assess how closely primary and inter/intra duplicate sample results match. RPDs are a quantitative measure of the accuracy of the analytical results and are calculated in accordance with the procedure described in *AS 4482.1 – 2005* (Standards Australia 2005). According to *AS 4482.1 – 2005* typical RPDs are expected to range between 30% and 50%; however, this may be higher for organics and for low concentrations of analytes. GHD adopts 30% for inorganics and 50% for organics as the general assessment criteria.

Where a result is below the laboratory limit of reporting (LOR) for one of the paired samples, the concentration assigned to that sample is the LOR. Where both results are reported below laboratory LOR the RPD is not calculated.

The QC samples analysed during the groundwater investigation are listed in Table 3.

Table 3 Analysed quality control (QC) samples

Primary sample	Duplicate type	QC sample laboratory ID	QC sample field ID	Date sampled	Lab report number	Matrix
SW01	Intra	ES1706190-005	DUP1	15/03/2017	ES1706190	Water
SW01	Inter	S17-Ma17192	SPLIT1	15/03/2017	538199	Water
SS01	Intra	ES1706190-009	DUP1	15/03/2017	ES1706190	Soil
SS01	Inter	S17-Ma17193	SPLIT1	15/03/2017	538199	Soil

RPD exceedances were reported during this investigation.

Sediments:

DUP1 – Primary sample SS01 – Exchangeable Calcium 72%

CEC 72%

Lead 44%

Nickel 33%

Zinc 35%

SPLIT1 – Primary sample SS01 – Copper 44%

Lead 33%

Zinc 33%

TRH C_{15}-C_{28} 117%

TRH C_{10}-C_{36} 149%

Surface Water:

DUP1 – Primary sample SW01 – Arsenic 40%

Chromium 67%

Zinc 32%

SPLIT1 – Primary sample SW01 – Nickel 40%

Laboratory quality assurance / quality control

Laboratory methods used by the primary laboratory were suitable for environmental contaminant analysis and are based on established internationally recognised procedures such as those published by the United States Environmental Protection Agency (US EPA), American Public Health Association (APHA), AS and National Environment Protection (Assessment of Site Contamination) Measure (NEPM).

The individual testing laboratory conducted an assessment of the laboratory QC program however the results were also independently reviewed and assessed internally by GHD. Recovery targets below are defined in the ALS QA/QC section of the certificates of analysis reports. All laboratory QA/QC results are documented with the laboratory certificates of analysis in the appendices of the relevant site report.

Laboratory quality control procedures

Laboratory QC samples incorporated in the analytical process include:

Laboratory blind duplicate samples

A laboratory blind duplicate provides data on the analytical precision and reproducibility of the analytical result. The laboratory blind duplicate is created by sub sampling from one of the primary samples submitted for analysis. Laboratory blind duplicates are analysed at a rate equivalent to one in twenty samples per analytical batch, or one sample per batch if less than twenty samples are analysed in a batch.

The permitted ranges for the RPD of laboratory blind duplicates are dependent on the magnitude of the results in comparison to the level of reporting as shown in Table 4.

Table 4 Permitted laboratory blind duplicate relative percentage difference (RPD) ranges

Magnitude of result	Permitted RPD range
< 10 x limit of reporting (LOR)	No limits
10 – 20 x LOR	0% - 50%
> 20 x LOR	0% - 30%

Matrix spike recoveries

Matrix spike sample analysis is the analysis of one or more replicate portions of samples from the batch, after fortifying the additional portion(s) with known quantities of the analyte(s) of interest. The percentage recovery of target analyte(s) from matrix spike samples is used to determine the bias of the method in the specific sample matrix. Recoveries must lie between 70% and 130%.

Laboratory control sample

The laboratory control sample (LCS) analysis of either a reference material or a control matrix fortified with analytes representative of the analyte class. The purpose of LCS is to monitor method precision and accuracy independent of the sample matrix. Typically, the percentage recovery of the LCS is compared to the dynamic recovery limit based on the statistical analysis of the processed LCS analysis. The ALS acceptance criteria, indicates recoveries must lie between 70% and 130%.

Surrogate spike recoveries

Surrogate Spikes provide a means of checking that no gross errors have occurred during any stage of the analytical method leading to significant analyte loss. Surrogate recoveries are similar to the analyte of interest in terms of chemical composition, extractability, and chromatographic conditions (retention time), but which are not normally found in environmental samples. Surrogate compounds are spiked into blanks, standards and samples submitted for organic analyses by gas-chromatographic techniques prior to sample extraction. Recoveries must lie between 50% and 150% for all analytes.

Method blank samples

Method or analysis blank sample analysis is the analysis of a sample that is as free as possible of the analytes of interest, but has been prepared the same manner as the samples under investigation. The analysis is to ascertain if laboratory reagent, glassware and other laboratory consumables contribute to the observed concentration of analytes in the process batch. If below the maximum acceptable method blank (20% of the practical quantification limit), the contribution is subtracted from the gross analytical signal for each analysis before calculating the sample analyte concentration. The method blank should return analyte concentrations as ‘not detected’.

The individual testing laboratory conducted an assessment of the laboratory QC program internally. However, the results were also independently reviewed and assessed by GHD.

Laboratory quality control results

All laboratory RPDs, matrix spike, LCSs and method blanks were within the ALS acceptable ranges.

Table 5 Outliers: Frequency of Quality Control Samples – six analytes

Laboratory report	Quality Control Sample	Analytes	Sample Code	results	Comment
ES1706190	Matrix Spike	Total organic carbon (Soil)	Anonymous	not determined	MS recovery not determined, background level greater than or equal to 4x spike level
	Matrix Spike	Sulfate as SO4	Anonymous	not determined	MS recovery not determined, background level greater than or equal to 4x spike level
	Matrix Spike	Mercury	Anonymous	47.7%	Recovery less than lower data quality objective
	Frequency of quality control samples	4			

Sample holding times

All samples were extracted and analysed by the laboratory within holding times.

Evaluation of DQI

To minimise the potential for decision errors, the sampling and analysis program completed at the site by GHD has been evaluated with consideration of the Data Quality Indicators (DQIs) described in Section 3, namely representativeness, completeness, comparability, precision and accuracy.

- Data representativeness: The sampling methodology ensured all environmental samples were collected by a set of uniform and systematic methods. Laboratory and field QA/QC procedures were carried out to ensure data representativeness. All samples were provided to the laboratory with adequate preservation and in compliant containers as stated in the laboratory sample receipt documentation. Consequently, data representativeness is considered to have been satisfied.
- Completeness: It is considered that the field QA/QC procedures carried out such as blind duplicate collection frequencies and the analytes tested provide completeness in terms of the required number of field duplicate samples. Laboratory QA/QC sample analysis is considered sufficient to provide a complete overview of QA/QC procedures.
- Precision: Field blind duplicate results reported RPDs below the adopted criterion (30% for inorganics and 50% for organics). GHD therefore considers that laboratory results are acceptable for interpretation in this report.

- Accuracy: Environmental sampling procedures ensured that collection, preservation and laboratory analytical techniques are appropriate for analysis of environmental contaminants.
- Comparability: All field work was conducted with reference to the Australian Standards, which ensured all environmental samples were collected by a set of uniform and systematic methods, as required by GHD's QA system. GHD considers that the laboratory data are of a suitable quality for assessing the environmental status of the site.

The overall review of the QC results from the primary and secondary laboratories indicates that the current analytical data are of an acceptable quality upon which to draw meaningful conclusions regarding impacts at the site as part of this investigation.

Appendix F – Equipment calibration certificates

Multi Parameter Water Meter

Instrument YSI Quatro Pro Plus
Serial No. 12D100011

Air-Met Scientific Pty Ltd
1300 137 067

Item	Test	Pass	Comments
Battery	Charge Condition	✓	
	Fuses	✓	
	Capacity	✓	
Switch/keypad	Operation	✓	
Display	Intensity	✓	
	Operation (segments)	✓	
Grill Filter	Condition	✓	
	Seal	✓	
PCB	Condition	✓	
Connectors	Condition	✓	
Sensor	1. pH	✓	
	2. mV	✓	
	3. EC	✓	
	4. D.O	✓	
	5. Temp	✓	
Alarms	Beeper	✓	
	Settings	✓	
Software	Version	✓	
Data logger	Operation	✓	
Download	Operation	✓	
Other tests:			

Certificate of Calibration

This is to certify that the above instrument has been calibrated to the following specifications:

Sensor	Serial no	Standard Solutions	Certified	Solution Bottle Number	Instrument Reading
1. pH 7.00		pH 7.00		288773	pH 6.89
2. pH 4.00		pH 4.00		288994	pH 4.05
3. pH 10.00		pH 10.00		291176	pH 9.30
3. mV		230.7mV		OB1388/OB1390	230.5mV
4. EC		2.76mS		290786	2.76mS
6. D.O		0.00 ppm		4346	0.00ppm
7. Temp		21.7°C		MultiTherm	21.6°C

Calibrated by: **Lin Wang**

Calibration date: **14/03/2017**

Next calibration due: **10/09/2017**

GHD

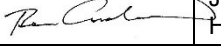
133 Castlereagh St Sydney NSW 2000

-

T: +61 2 9239 7100 F: +61 2 9239 7199 E: sydmail@ghd.com.au

\\ghdnet\ghd\AU\Sydney\Projects\21\25583\WP\219553.docx

Document Status

Revision	Author	Reviewer		Approved for Issue		
		Name	Signature	Name	Signature	Date
A	T. Nham A. Walker	J. Hallchurch		J. Hallchurch		28/04/2017
0	B Anderson	B. Anderson		J. Hallchurch		26/04/2019

www.ghd.com